THE SURVEYOR, ENGINEER, AND ARCHITECT;

OR

LONDON MONTHLY JOURNAL OF THE PHYSICAL AND PRACTICAL SCIENCES

IN ALL THEIR DEPARTMENTS.

BY A COMMITTEE OF PRACTICAL SURVEYORS, ENGINEERS, AND ARCHITECTS, OF MUCH EXPERIENCE AND IN ACTIVE EMPLOYMENT.

ROBERT MUDIE, LITERARY CONDUCTOR.

SCIENTIFIC AND PROFESSIONAL INSTITUTIONS:—THEIR ADVANTAGES TO INDIVIDUALS, AND TO THE PUBLIC.

AMONG the improvements of which the present age is so fertile, there is none which has a more beneficial tendency than the frequent associating of professional gentlemen, for the discussion of subjects connected with their professions, or of those collateral subjects, by which different professions are reciprocally made the instructors of each other, and the whole are connected with and guided by the general volume of scientific knowledge, whether of the productions and phenomena of nature, or of the application of these to the purposes of improving the comforts and elevating the characters of mankind generally.

Such associations have all along been the most efficient instruments in awakening a spirit of inquiry among the people; and, though we mean to cast no reflection upon those ancient and highly useful establishments which have deservedly acquired so much name for their learning, we must be permitted to say that there is a vital principle in the institutions to which we allude which belongs not to those others, how great soever may be their value in other respects:—the marked line of distinction which must always be drawn between instructor and student, in a professed seminary, whatever may be its rank, prevents that full collision of mind with mind, whereby the fire of genius is elicited, and the race of improvement run with equal advantage and pleasure.

In those institutions, or societies, or whatever else may be their names, to which we allude, there is no line of distinction of this kind; for, there, the man of experience and the beginner, the man of talent and the man who is still seeking to acquire it, meet upon exactly the same footing in as far as they are members of the society. But, notwithstanding this, it by no means follows that every one of them shall not be held in estimation in the exact ratio of his merits. Indeed, it is only in such a society—a society which knows no distinction of members, except those who have the management of its affairs—that each man's ability can find its proper level; that instruction can be obtained without the least feeling of humiliation; and that all can be stimulated with the same zeal for improvement.

This is in itself a very great advantage; but there are many others. Inventions are brought forward, and their merits or demerits better seen than they could possibly be by any other means whatsoever. The discussions, which are usually brief and conversational, and have none of the formality of set lectures, are much better calculated for eliciting new truths, and elucidating old ones, than any discourses which could be given by one dictator to a company of listeners. In that case, those who do not comprehend any portion of the discourse have no means of getting it cleared up; and they who have doubts have as little means of getting them removed or substantiated: for these reasons, and also because there must be something thrown into every discourse of a somewhat *ad captandum* nature, in order to keep the attention of the audience on the stretch, there is always an air of entertainment and spectacle about a discourse of this kind, however important may be its subject, and how able soever its general execution. Besides, if one is to learn from discourses, these discourses must be far shorter, and kept more closely to one subject, than would suit the purposes of the lecturer, or win the attention of a mixed audience. This is proved by the fact, that scarcely any man can be a popular lecturer at those institutions where it is customary to give lectures, unless he calls in the assistance of apparatus, or diagrams, or something else which attracts the eye. Now these attractions, though found to be almost indispensable to the success of the lecturer, seldom fail in breaking the concatenation of what he delivers; and hence, if those who attend such a lecture are questioned after leaving it, it will invariably be found that they understand and remember much better that which they have seen than that which they have heard. Here, again, we must enter our caveat. We are not condemning the practice of delivering public lectures upon subjects of instruction, or even subjects of entertainment, for they not only put ordinary people in the way of knowledge, but prevent them from deviating into other ways which are not so profitable, and in the end not so pleasant. We do say, however, with full conviction of the truth of the saying, that no man ever yet acquired, or ever can acquire, professional eminence by hearing lectures on his profession; while such lectures would have but few attractions beyond the pale of that profession. The subject, or the model, if the case relates to that, with a short notice of the means and advantages of using it, with reasons for the latter, stated briefly and clearly, are all that are required for such a purpose; and then the candid but scrutinizing examination of them, by such parties as choose to do so, brings their real merits to the test at once. Then, as many proposals which are sound upon the whole have their weak points; and as many inventions are excellent in one point, and faulty in another; the meeting of the institution becomes an experimental school for all who choose to bring their projects or their inventions before it. This is of the greatest benefit to all parties; and the more varied that these displays are within the legitimate range of the profession, and all subjects which bear upon that profession, they are the more advantageous. The greatest advantage is to the junior members of the institution; because it gives them a range of observation far greater than they can possibly obtain in the offices of their instructors. From the very nature of the professions, the men of most practice must direct their chief attention to single branches; because each must date the beginning of his celebrity from some particular work, and, after this, he would be sought for, for works of the same kind with this, rather than for those which are of a different character. Hence there is, even in eminence itself, a tendency to narrow the range of those who acquire eminence; and this necessarily also narrows the range to those who seek professional knowledge under them. The meetings of the institution tend greatly to counteract this on the part of both; for the man who in his practice stands high in any one department will endeavour, when he comes into open collision with those who are eminent in the other departments, to keep at least his knowledge of the principles up to theirs.

The Royal Society, during the first half or three-quarters of a century of its existence, affords a good illustration of the general truth which we are endeavouring to explain; for it drew together and gave scope for the talent of many of the best philosophers of the age. Indeed, this society was the association which first brought philosophy out of the seclusion of the schools, showed its close connection with all the most important of the arts, and so placed it upon the only ground where it could display the full extent of its usefulness. The beginning was no doubt comparatively small, and the very early progress by no means rapid, but still the vast number of subjects, and of truths connected with those subjects, which were brought forward at its meetings, and published in its transactions; and also the books, the experiments, and the other results, all tending to speed the course of true philosophy, gave useful learning an activity among its possessors, and a respect in the estimation of the public, which it had never before possessed in England. And the influence which it had in this way was by no means confined to the members of the society, or the mere sciences, arts, and other subjects which occupied their attention. It told powerfully upon the people; and, though some satirists affected to ridicule those who

"Shone in the dignity of F.R.S."

yet the persons holding this dignity did more for promoting the

real welfare of their country, than had been done by any class of dignitaries previous to their time.

This society was probably the best adapted for the period of its establishment; but it was adapted chiefly for that period. It could not well have been otherwise; because no men, however wise in their own day and generation, can possibly anticipate the condition of future ages in respect of knowledge, so as to legislate for them upon that matter. The Royal Society was intermediate, in its main character, between the schools and those institutions of professional men which we are considering. It was quite miscellaneous, embracing all sorts of subjects, while the purpose of the society did not form the professional occupation of any one of its members. Therefore it had no bond of union, save those of courtesy, and the simple fact of being connected with it. Therefore it wanted the vital principle which would have made it maintain its position, and continue to hold that superiority over the population generally which it had in its early days. It was, in fact, dimmed by the very light which it had shed upon others; and the impulse which it had given to the public made that public overtake it. Still it lived and lives, though in a great measure upon the memory of its former renown; and, though we do not absolutely say that it has fallen off, yet the rapid progress of the rest of the world has given it very much this appearance. The grand movement in science, especially in science as applied to the arts, has originated, not with philosophers of the closet, but with men in active employment; and though the greater number of these have ultimately had their names placed upon the books of the society, they have not sought this as a means of elevating themselves, but have been invited, in order to give éclat to the society itself. Such men have, of course, been too actively employed in their own professions, for taking a lead in the business of a society so very general in its objects; and the consequence has been, that it has been taken under the patronage of titled men having no great connection with science, and not necessarily much knowledge of it. It has, in short, leaned upon the great; and we need not say that necessity for a crutch is always indicative of weakness or decay. We mean no disrespect to this venerable establishment, but quite the reverse; yet its subjects and objects have been so multifarious that it may be said to be something like the Irishman's wooden gun, with which "he aimed at everybody, but shot nobody."

The Society of Arts professed to have a more definite object than the Royal Society, but still it was and is of too miscellaneous a nature for giving much impulse to any one art. Its main object seems to have been to encourage, and in some instances to reward, individual efforts. Now the principle of this is faulty in two respects. In the first place, the real promotion of the arts does not depend so much upon individual results as upon cultivation of the requisite abilities, and the explaining of those general relations by which each art leads to its own improvement, and also that of the others; and, in the second place, the giving of rewards is in itself calculated to produce a mercenary spirit; and, however fairly the rewards may be given, they act as public dispiritings to the unsuccessful candidates. It may be that this society did good in the prime of its days; but, like the former, it has either fallen behind the spirit of the present time, or the spirit of the time has got in advance of it. It is still respectable in its venerable years; but we are not aware of any one great discovery, invention, or improvement, which originated with the society. Its collection of models and other analogous matters is ample and varied, but we believe the number which have come into common use forms an exceedingly small fraction of the whole. In addition to its too miscellaneous nature, this society has estranged itself from the real arts, and their advancement, by the very same means which have made genuine science—"take unto herself wings, and flee away" from the Royal Society. In other words, it has been a patronage institution; but as its patrons have not uniformly been of such lofty pretensions as those of its elder sister, it probably has not suffered so much upon this account.

We again reiterate our caveat against being misunderstood. We do not deny usefulness to either the one or the other of these institutions. They have both been useful—the former eminently so; and, as they originated in ages when men were less generally informed, and minds were less energetic than they are now, they were perhaps better adapted to the then state of society than if they had been constructed on the models of more recent institutions. But, while we allow them the full credit of the good they have done, we must not conceal the truth, with regard to their being somewhat antiquated, and not so suitable to the present state of things. They too must not mind this; for, among all living things, it is the law of nature, that one generation, or one system or mode, shall decay and give place to another. It is so with living languages, and with all those vital institutions which profess to go hand in hand with society, and render themselves equally useful to it, in all the changes of its state. These venerable institutions must not be offended, or even lament, though their juniors do exhibit more vigour, and come more directly in contact with the working world. We all know that, if we are not cut off by casualty, we shall wax feeble, and decline, and even wish for the grave, as a final place of retreat from that world in whose active turmoil we are no longer able to play our parts; but, when we begin to feel the forecast shadow of mortality, we do not take up our lamentation because of our children being then in the very prime of bodily activity and mental energy. On the other hand, we remind them of what we have done in our day, express a hope that they will yet more and more excel us, bless them, bid them God speed; and so go down to the abode of our fathers with that resignation which becomes men who know their doom. It is even so with all institutions which have man, and man's moral improvement, for their chief objects. The more vigorous institutions of the present time are rising upon the decline of those of times gone by, and future ones will arise upon the ruins of the present, whenever the state of society renders such a change necessary. All are good in their seasons, but, when the season is over, they must yield to what the new season brings. This is not a melancholy subject, for it is part of the general system of things in the present world; and scientific associations can no more hope to change this general system than the ephemeræ of the northern summer can sport their tiny wings in the chilling atmosphere of the northern winter.

The Geological and Geographical Societies are much more confined to their single subjects than those already noticed; and the benefits which they have rendered to their respective sciences, and also to general knowledge, have been correspondingly great. Since the former society was founded, far more has been learned respecting that portion of the earth's crust which is open to human observation than would perhaps have been known in ten times the number of years if no such a society had existed. Now geology is so closely connected with agriculture, with mining, with field-engineering, with architecture, and with almost the whole of the more important arts, that the extension of it gives an impulse, and also the means of applying it, to all the rest. Indeed it was the want of anything like system and philosophy, respecting the order in which the strata of the earth are super-posed upon each other, and where those strata which consist of or contain valuable substances are to be found, which was the grand bar in the way of adapting art to the system of nature. As long as mineralogy consisted of little else than a cabinet of specimens and a catalogue of names, and cosmogonies or theories of the earth's formation were wholly artificial, and had no foundation save the fancy of the framer, the practical miner, the agriculturist, or indeed any one else, could derive no advantage from them; but, when geology became a science, and the order and place of all the strata—in England, for instance, became fully known, the agriculturist knew the nature of his soil, and the miner, not only the locality of the mineral he sought, but where and how to commence the working of it to the best advantage. By the same means, that is, by means of knowledge which is grounded upon a sure basis, and, therefore, true, many idle fears and vain hopes have been done away with. Many years have not elapsed since men of no mean ability were in the habit of calculating how many years or centuries would elapse before the coal-fields of England should be exhausted, and the people starved out of the country for the want of this most valuable article of fuel. If these calculators had lived at the present time, their fears would have been greatly strengthened, and the period of starvation by cold brought into more immediate view; because, for all purposes, and especially for the making of iron—the quantity of which now required is very great, and much of it for engineering purposes, coal is worked to a far greater extent than formerly. But coal assists, and assists greatly, in working itself, as, with the aid

of the steam engine, it drains with more power, and from a greater depth, and also draws up the materials. But Geology has shown that no one need be alarmed at the apprehended exhaustion of this most valuable mineral, until, perhaps, the geologic period for change shall have arrived, when England shall be depressed under the waters of the ocean, and a new England upheaved in some other situation; all this, too, not by any violent convulsion, but by that gradual and quiet process which works all the decompositions, all the reformations, and all the changes of sublunary things.

Nor have the labours, which the meetings and the conversations at the Geographical Society have caused to be performed, been of less service to the public. On the contrary, they have been of more, because the field is wider, and stocked with a much greater variety. With reference to every thing terrestrial, in all the kingdoms and departments of wonder-working Nature, Geography is the *scientia scientiarum*, of which all the rest are merely component parts. As long as Geography consisted in a muster-roll of names, a series of descriptions, and a few maps — usually made worse at every transcription, just as was the case with frequently copied manuscripts before the invention of printing; — while this was the extent of materials, and these were obtained from the book, and from the book only, Geography was but an idle tale. But in the present times the case is different: able men, going to all parts of the world for purposes entirely geographical, take note of every department of the science; their reports are discussed before the society, and so sifted that few mistakes can escape detection. It is one of the advantages of all institutions of this kind that they publish Transactions, that is, collections of such papers sent to them, or read at their meetings, as are deemed worthy of this distinction. Some judgment is required in making these selections, and there may be wrong ones; but this is no fault of the general plan of the institutions.

Those societies which we have hitherto mentioned may be said to be scientific rather than professional, because few or none of the members follow as a profession that which constitutes the name of the society. But those which we have now to mention, and to which the general scope of our journal more expressly relates, are professional rather than scientific. Of course, science must be embodied in them, and a greater variety of science than is required for any of the others; but it is science having a particular direction, in which sense it is professional. This renders those institutions more necessary, and, to the professions at least, more useful, than any of the others.

They are necessary for mutual instruction, and we have already mentioned how well they are calculated for effecting this. But they have another usefulness, in being a sort of bond of union among those who are so placed that it is very difficult for them to be without mutual jealousies of each other. All men of the same profession are, of necessity, rivals, and it is exceedingly difficult for rivals to avoid being jealous of each other, which jealousy is apt occasionally to increase to hatred. It is not only among Surveyors, Engineers, and Architects, that this rivalship exists, for it extends to all professions, and even to all trades; and, although there is an *esprit du corps* which unites them in favour of the profession, even the laudable desire of being foremost sometimes increases to a jealousy, and something more than a jealousy, far stronger than the common feeling for the profession. Hence it is very possible for two musicians to be most harmonious with their instruments, while their feelings towards each other are all the while in perfect discord; and the same runs throughout the whole. When, however, they meet at an institution where they are all upon an equality, the *esprit du corps* is strengthened, the jealousy weakened, and the dislike of each other completely cured. We shall mention no names, but those who have attended to such matters cannot fail to call to mind instances of men of the first eminence standing aloof from, and endeavouring to thwart each other, when, had they been in close co-operation, and mutual interchange of talent, would have found themselves bettered in every respect. The bringing of those professional rivals frequently together, in friendly intercourse, in which there can be no rivalship, and which is yet intimately connected with their professions, is by no means the least of the advantages which those institutions confer; and the advantage is the greater that it applies most strongly to the eminent men who contend for the highest professional prizes; and, if these are seen publicly in harmonious pursuit of the same objects, it prevents those of less eminence from becoming partisans, and thus prevents jealousy and dislike throughout the whole profession. By this means, all can lay their difficulties, or bring their lessons of instruction, freely and fully before each other; at the same time that each runs his own personal course, assisted where he requires assistance, and with a feeling that he has done good to others when he has communicated knowledge to them. No doubt, very judicious and perfectly unbiassed management are pre-supposed, in order that the full advantage of this may be reaped. These may not always exist, but we may presume that the presence of them is the rule, and the absence only the exception.

On some future occasions we purpose to give short notices of these institutions, as composed of parties belonging to the professions named in our title; in glancing over the list however, we are not a little astonished at finding no name of an Institution of Surveyors. We have already had occasion to remark that this is one of the most valuable of the three professions, because more bungling and loss have resulted from careless and unskilful surveying than from the same faults in engineering and architecture. But the errors of surveyors are hidden from public observation, while those of the others stand palpably and permanently recorded in their works, and can be seen by every body. When we again revert to the subject, we shall take first in order the Institution of Civil Engineers.

DESCRIPTION OF THE WOOD-CUT VIEWS, &c.

Like printing itself, wood engraving is entirely an invention of modern times, yet it is but of late years that it can be said to have been brought into general use, and applied, in conjunction with typography, for the diffusion of popular information, notwithstanding that it was in fact the earlier of the two processes, printing from wooden blocks having preceded the employment of moveable metal types; and it would further seem that the former mode was practised in China about 500 years before it was thought of in Europe. To Bewick the art is under great obligations: he revived it in this country, materially improved its technical execution, and so refined it that, in comparison with his productions, earlier ones look coarse and rude. Still, however tasteful as specimens, they were little more than book embellishments, "head pieces and tail pieces," as they are termed, and frequently without any interest further than showing what might be accomplished; while, even as such, they will suffer by comparison with many things that have since been produced.

Within the last ten years, wood engraving has become one of the most popular and useful branches of art, having been brought into extensive vogue both in this country and on the continent; more especially in France, where the series of *Editions Pittoresques*, of Moliere, Gil Blas, and other classic authors or productions, display great talent. Yet, notwithstanding that many of the embellishments in these and some of our own "Illustrated" and "Pictorial" works would formerly have been considered chefs d'œuvre, the publications themselves are among the very cheapest that issue from the press. The comparatively great economy of this mode of graphic representation strongly recommends it; still we are of opinion that it is not always discreetly employed, since it frequently aims at what is beyond its power and its legitimate province. Admirably as it is suited for the representation of single objects, or one or more grouped together, it is unfit for complex subjects, or any demanding elaborate execution, and a perfect gradation of chiaro-oscuro and aerial perspective; for, although even in this respect, much may now be achieved in it, the process then becomes an expensive one. On the contrary, where either mere form, or sketchiness, sparkle and brilliancy, are required, its services are highly valuable. Hence it is well calculated for purposes of graphic description, for buildings, furniture, pieces of antiquity, &c., where not the mere amusement of the imagination, but positive information as to the things themselves, is the chief requisite. By such application of it, much instruction has already been conveyed through its medium, to a large class of readers who had formerly no access at all to aught of the kind. The "Elgin" and "Townley Marbles," for instance, in the Library of Entertaining Knowledge,

have no doubt diffused a taste for such studies, to say nothing of the efficient aid they afford the memory. As little doubt can there be that topography and architecture have been greatly popularized by the frequency of such subjects in various cheap periodicals. It is true, much cannot be said in praise of the majority, which are decidedly bad; grossly inaccurate as representations, and no less defective in regard to execution. There certainly has been room for improvement, and this has been made manifest by the "Literary World," which has already so distinguished itself by its wood engravings, both as regards the choice of subjects and their execution, as to require no further commendation from us, even could we with propriety bestow it on the present occasion, than our calling attention to the four specimens which we have been favoured with the use of. We shall, therefore, only remark that they are for the most part of considerable interest in themselves, and many of them of buildings never before represented, some of them, in fact, but just completed; for instance, several of those in the series entitled, "London Street Architecture,"—as, for instance, the shop at the corner of the Quadrant, Regent Street, and various others.

STATUE OF THOMAS TELFORD, IN WESTMINSTER ABBEY.

This subject will of course possess interest for most of our readers, if only as showing a memorial lately erected to one who rendered such important services to science, to the public, and to the commercial prosperity of his country, by the numerous works he planned and conducted, among which, the suspension bridge across the Menai, would alone suffice for his fame. It is not our intention to enter here either into any biographical notice of Telford, or into any remarks relative to the various bridges, canals, &c., which he executed; but we may point out one production not very generally known to be his, namely, the treatise on Civil Architecture (about 150 quarto pages), in Brewster's Edinburgh Encyclopædia, which shows that he extended his studies considerably beyond his immediate professional range.

The statue is by Bailey, who has here managed the modern costume with some ability, so generalizing it as not to render it offensively stiff and awkward, and at the same time making use of it to display the form and limbs. More taste might have been shown in the pedestal, the octagonal socle or base to which does not tend to give it much elegance.

THE MONUMENT OF SIR WALTER SCOTT, AT GLASGOW.

Acceptable as the engraving itself is as showing the structure, we can by no means second the praises which Dr. Dibdin has so libeliberally bestowed upon the latter in his "Northern Tour." Though sanctioned by classical precedent—Roman, not Grecian—it certainly does appear a gross absurdity to elevate a statue to a height at which little more than its general outline and proportions can be distinguishable. In the case of such monuments as Trajan's pillar, and its modern imitation, the column of the Place Vendome, at Paris, the fault is in a great degree redeemed by the statue being in some degree secondary in the design, a mere ornamental accessory and finish to the pillar itself on whose shaft are recorded the military achievements of the hero whose effigy terminates the whole. So far at least there is, in those instances, a certain unity and consistency of purpose, the shaft being not only an essential but the principal portion of the monument, strictly speaking; whereas, in the present and similar cases (the Melville column, Edinburgh, the Hill column, Shrewsbury, and the York column, St. James's Park, &c.*), no such motive exists. There is surely neither particular beauty nor propriety in erecting a mass of stonework, or a slender tower in form of a column, similar to those employed for supporting the entablature of a building, and that not for any particular convenience or advantage, but rather for a positive disadvantage, namely, the removing the statue to such a height as to render it comparatively insignificant and uninteresting, since it cannot properly be judged of either as a likeness or a work of art. Indeed, almost any thing in the shape of a human figure will do for such a situation; and so far there may be some economy in the matter, as a journeyman sculptor will serve very well for the production of such a work.

For the statue of a conqueror, a military or naval hero, one who has not achieved his actions by his own individual prowess or ability only, personal resemblance becomes a matter of comparatively minor consideration; but it might have been thought that the countrymen of Sir Walter Scott would, if they erected any statues at all to his memory, have desired that they should be portraitures of his person. Such they perhaps may be; but then their object is entirely frustrated, if the things themselves are virtually put out of sight, or at least beyond the reach of distinct vision. It is true that, in all such cases, we know for whom the figure is intended, although we cannot discern the lineaments of the countenance; but then the statue becomes a superfluity: an inscription on the pedestal, or the column itself, would answer the purpose just as well, as its name would serve as a memorial of the individual, in like manner as Pompey's pillar, and Cleopatra's needle, recall to mind those personages, though their effigies do not appear on them. Though these remarks are rather of a general nature, we avail ourselves of this opportunity to express our opinion on this point, because there is now an intention of erecting another column in the metropolis, to Nelson, which will be pretty much like most other things of the kind, except that it is to have a Corinthian capital.

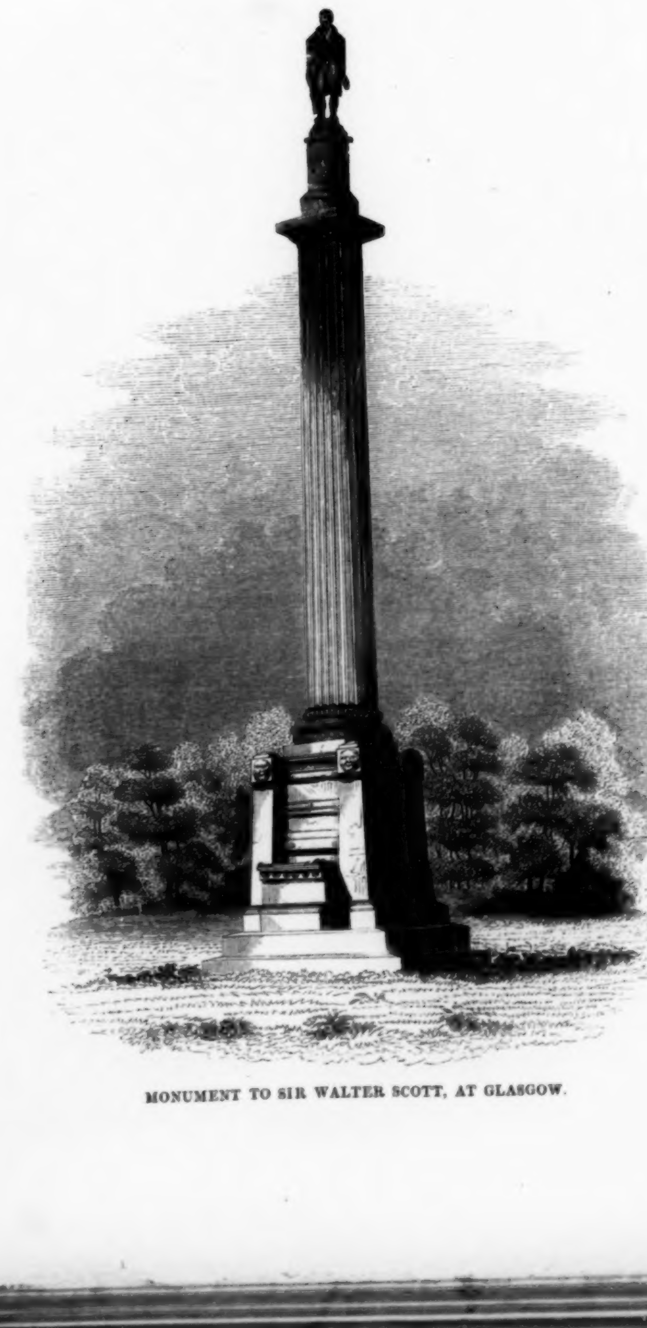
Passing on to a more particular notice of the individual subject before us, we must say, that though it disclaims originality in its general design, and evidently professes to adhere scrupulously to precedent where a deviation from it might have been a merit, great liberties are taken in several respects. The enriched base is not only quite at variance with the style indicated by the column itself, but is a positive disadvantage, inasmuch as it causes the capital to appear absolutely insignificant and mean,—quite disproportioned, in fact, to the foot of the shaft. Yet, surely if the architect did not scruple to deviate from general practice in regard to that lower member of the column, we do not perceive why he should have been deterred from treating the upper one with equal freedom. At any rate his design would then have been more consistent, and of a piece; whereas, at present, it looks as if he had at first intended the column to be a Corinthian one, or to have a deep and highly-enriched capital; but, after making his base accordingly, either changed or was compelled to abandon that idea, to abridge the heighth of his shaft, and surmount it by a shallow capital. Neither is the pedestal particularly good, except that the general form and proportions render it more suitable for its purpose than one of the usual kind. Another great defect—a defect, however, common to almost everything else of kind—is, that the whole presents to the eye only detached parts arbitrarily piled up one upon the other, without appearing to be sufficiently connected with and to grow out of each other: for instance, above the capital a second design commences again, and we have a lofty circular pedestal, with a statue upon it: and this sort of disconnection is rendered all the more offensive and awkward by the square abacus abruptly interrupting the circular forms of the shaft and upper pedestal, cutting and disuniting them without propriety or motive; because the reason that recommends such form of abacus in columns supporting an entablature renders it a fault—equally nonsensical and unsightly in an insulated column; whereas, a circular abacus would in such a case afford an agreeable and easy transition to the circular mass above it. From what we have heard of Mr. Burn, as an architect, we should have expected greater indication of artist-like conception and treatment of such a subject. We are unable to say what are the precise dimensions, but should judge the entire height not to be more than ninety feet.

PARKHILL'S SHOP, REGENT-STREET.

This is unquestionably the most imposing piece of design of its class yet executed in the metropolis, and that, too, not merely on account of its unusual degree of decoration, but for the mode in which it is treated, quite independently of embellishment and style. It has certainly one circumstance greatly in its favour, namely, its

* The Nelson column at Yarmouth, by Wilkins, surmounted by a colossal figure of Britannia, is less exceptionable, because, being an allegorical personification, the general form of the statue is sufficient for the spectator. The architect has also shown some degree of invention and originality, if not in the column itself, which is merely a Grecian Doric one, in other parts of the design; for he has raised his column not on a mere pedestal, but on an architectural basement, placed on a wider substructure or terrace; and has surmounted the capital by an elegant open gallery, whose roof is supported by four caryatides. This column has moreover something like utility in its favour, because it serves as a land-mark from the sea.

STATUE OF THOMAS TELFORD, IN WESTMINSTER ABBEY, BY BAILEY.



MONUMENT TO SIR WALTER SCOTT, AT GLASGOW.

have no doubt diffused a taste for such studies, to say nothing of the efficient aid they afford the memory. As little doubt can there be that topography and architecture have been greatly popularized by the frequency of such subjects in various cheap periodicals. It is true, much cannot be said in praise of the majority, which are decidedly bad; grossly inaccurate as representations, and no less defective in regard to execution. There certainly has been room for improvement, and this has been made manifest by the "Literary World," which has already so distinguished itself by its wood engravings, both as regards the choice of subjects and their execution, as to require no further commendation from us, even could we with propriety bestow it on the present occasion, than our calling attention to the four specimens which we have been favoured with the use of. We shall, therefore, only remark that they are for the most part of considerable interest in themselves, and many of them of buildings never before represented, some of them, in fact, but just completed; for instance, several of those in the series entitled, "London Street Architecture,"—as, for instance, the shop at the corner of the Quadrant, Regent Street, and various others.

STATUE OF THOMAS TELFORD, IN WESTMINSTER ABBEY.

This subject will of course possess interest for most of our readers, if only as showing a memorial lately erected to one who rendered such important services to science, to the public, and to the commercial prosperity of his country, by the numerous works he planned and conducted, among which, the suspension bridge across the Menai, would alone suffice for his fame. It is not our intention to enter here either into any biographical notice of Telford, or into any remarks relative to the various bridges, canals, &c., which he executed; but we may point out one production not very generally known to be his, namely, the treatise on Civil Architecture (about 150 quarto pages), in Brewster's Edinburgh Encyclopædia, which shows that he extended his studies considerably beyond his immediate professional range.

The statue is by Bailey, who has here managed the modern costume with some ability, so generalizing it as not to render it offensively stiff and awkward, and at the same time making use of it to display the form and limbs. More taste might have been shown in the pedestal, the octagonal socle or base to which does not tend to give it much elegance.

THE MONUMENT OF SIR WALTER SCOTT, AT GLASGOW.

Acceptable as the engraving itself is as showing the structure, we can by no means second the praises which Dr. Dibdin has so libeliberally bestowed upon the latter in his "Northern Tour." Though sanctioned by classical precedent—Roman, not Grecian—it certainly does appear a gross absurdity to elevate a statue to a height at which little more than its general outline and proportions can be distinguishable. In the case of such monuments as Trajan's pillar, and its modern imitation, the column of the Place Vendome, at Paris, the fault is in a great degree redeemed by the statue being in some degree secondary in the design, a mere ornamental accessory and finish to the pillar itself on whose shaft are recorded the military achievements of the hero whose effigy terminates the whole. So far at least there is, in those instances, a certain unity and consistency of purpose, the shaft being not only an essential but the principal portion of the monument, strictly speaking; whereas, in the present and similar cases (the Melville column, Edinburgh, the Hill column, Shrewsbury, and the York column, St. James's Park, &c.*), no such motive exists. There is surely neither particular beauty nor propriety in erecting a mass of stonework, or a slender tower in form of a column, similar to those employed for supporting the entablature of a building, and that not for any particular convenience or advantage, but rather for a positive disadvantage, namely, the removing the statue to such a height as to render it comparatively insignificant and uninteresting, since it cannot properly be judged of either as a likeness or a work of art. Indeed, almost any thing in the shape of a human figure will do for such a situation; and so far there may be some economy in the matter, as a journeyman sculptor will serve very well for the production of such a work.

For the statue of a conqueror, a military or naval hero, one who has not achieved his actions by his own individual prowess or ability only, personal resemblance becomes a matter of comparatively minor consideration; but it might have been thought that the countrymen of Sir Walter Scott would, if they erected any statues at all to his memory, have desired that they should be portraitures of his person. Such they perhaps may be; but then their object is entirely frustrated, if the things themselves are virtually put out of sight, or at least beyond the reach of distinct vision. It is true that, in all such cases, we know for whom the figure is intended, although we cannot discern the lineaments of the countenance; but then the statue becomes a superfluity: an inscription on the pedestal, or the column itself, would answer the purpose just as well, as its name would serve as a memorial of the individual, in like manner as Pompey's pillar, and Cleopatra's needle, recall to mind those personages, though their effigies do not appear on them. Though these remarks are rather of a general nature, we avail ourselves of this opportunity to express our opinion on this point, because there is now an intention of erecting another column in the metropolis, to Nelson, which will be pretty much like most other things of the kind, except that it is to have a Corinthian capital.

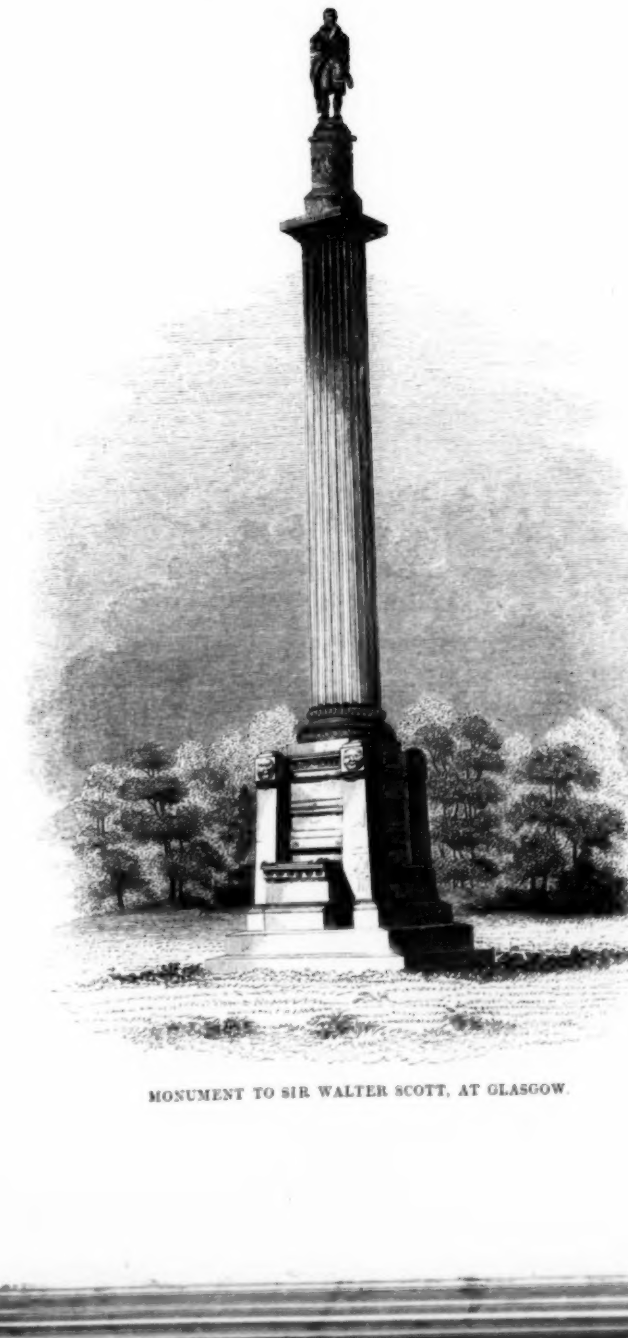
Passing on to a more particular notice of the individual subject before us, we must say, that though it disclaims originality in its general design, and evidently professes to adhere scrupulously to precedent where a deviation from it might have been a merit, great liberties are taken in several respects. The enriched base is not only quite at variance with the style indicated by the column itself, but is a positive disadvantage, inasmuch as it causes the capital to appear absolutely insignificant and mean,—quite disproportioned, in fact, to the foot of the shaft. Yet, surely if the architect did not scruple to deviate from general practice in regard to that lower member of the column, we do not perceive why he should have been deterred from treating the upper one with equal freedom. At any rate his design would then have been more consistent, and of a piece; whereas, at present, it looks as if he had at first intended the column to be a Corinthian one, or to have a deep and highly-enriched capital; but, after making his base accordingly, either changed or was compelled to abandon that idea, to abridge the heighth of his shaft, and surmount it by a shallow capital. Neither is the pedestal particularly good, except that the general form and proportions render it more suitable for its purpose than one of the usual kind. Another great defect—a defect, however, common to almost everything else of kind—is, that the whole presents to the eye only detached parts arbitrarily piled up one upon the other, without appearing to be sufficiently connected with and to grow out of each other: for instance, above the capital a second design commences again, and we have a lofty circular pedestal, with a statue upon it: and this sort of disconnection is rendered all the more offensive and awkward by the square abacus abruptly interrupting the circular forms of the shaft and upper pedestal, cutting and disuniting them without propriety or motive; because the reason that recommends such form of abacus in columns supporting an entablature renders it a fault—equally nonsensical and unsightly in an insulated column; whereas, a circular abacus would in such a case afford an agreeable and easy transition to the circular mass above it. From what we have heard of Mr. Burn, as an architect, we should have expected greater indication of artist-like conception and treatment of such a subject. We are unable to say what are the precise dimensions, but should judge the entire height not to be more than ninety feet.

PARKHILL'S SHOP, REGENT-STREET.

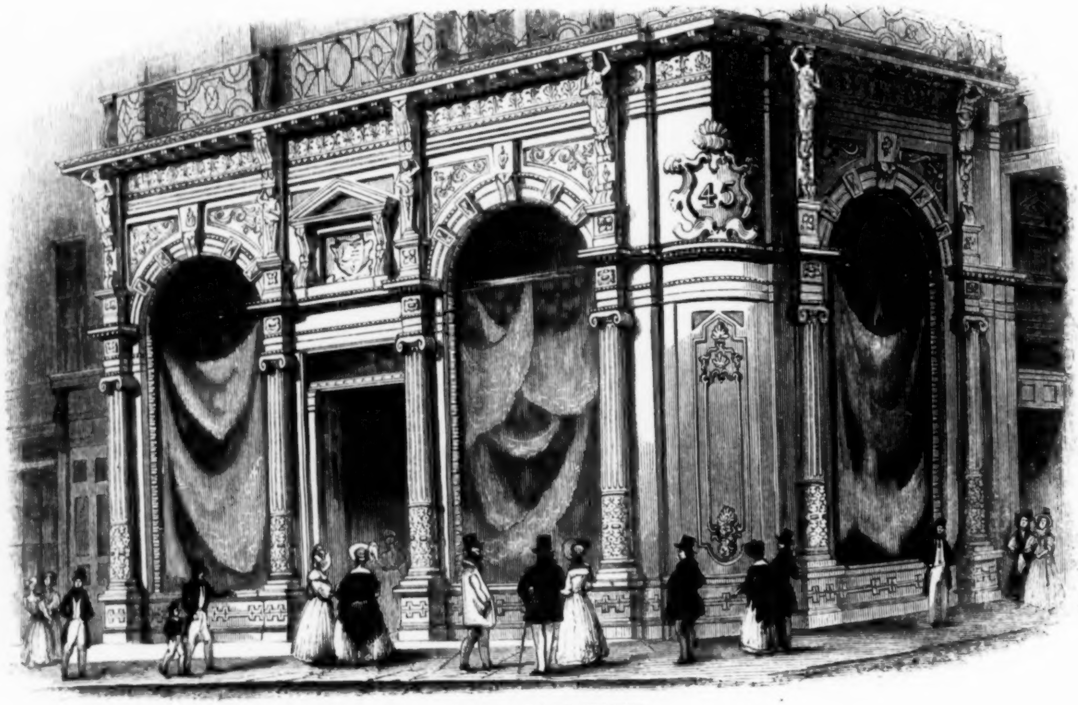
This is unquestionably the most imposing piece of design of its class yet executed in the metropolis, and that, too, not merely on account of its unusual degree of decoration, but for the mode in which it is treated, quite independently of embellishment and style. It has certainly one circumstance greatly in its favour, namely, its

* The Nelson column at Yarmouth, by Wilkins, surmounted by a colossal figure of Britannia, is less exceptionable, because, being an allegorical personification, the general form of the statue is sufficient for the spectator. The architect has also shown some degree of invention and originality, if not in the column itself, which is merely a Grecian Doric one, in other parts of the design; for he has raised his column not on a mere pedestal, but on an architectural basement, placed on a wider substructure or terrace; and has surmounted the capital by an elegant open gallery, whose roof is supported by four caryatides. This column has moreover something like utility in its favour, because it serves as a land mark from the sea.

STATUE OF THOMAS TELFORD, IN WESTMINSTER ABBEY,
BY BAILEY.



MONUMENT TO SIR WALTER SCOTT, AT GLASGOW.



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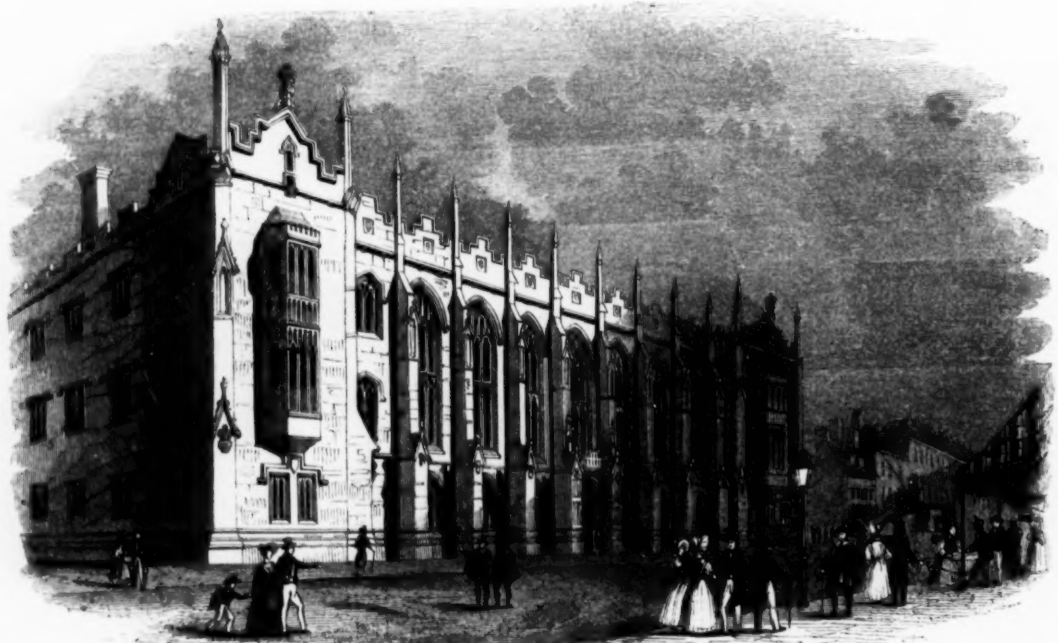

KING EDWARD'S SCHOOL, BIRMINGHAM.

standing at the angle of a street, so as to present two fronts; but, then, such also is the case with many other shops; where, so far from any advantage being taken of that circumstance, it is only employed to produce a gross architectural defect, the shop window being continued quite round the corner, and thereby producing a most disagreeable appearance of flimsiness and extreme weakness—as is the case with Hitchcock and Rogers' shop in St. Paul's Churchyard. Here, on the contrary, the angle of the building has a very unusual degree of solidity, and is so managed that, instead of producing any sort of blankness or heaviness, it is made to contribute very materially to the effect and character of the ensemble, even in regard to decoration; while the mode in which the transition has been effected from the curved face below to the overhanging square entablature above is exceedingly well-contrived and playful in itself, and accords admirably well with the genius of the particular style. Besides the one just noticed, another circumstance greatly in favour of this design is that, instead of the shop front being nearly all window and glass, there is some kind of solidity in the piers; neither is the decoration confined to a mere entablature over the columns, but is extended upwards, so as to give greater loftiness and importance to what is technically termed "the shop-front."

The style here adopted is the Renaissance or Elizabethan, and although we are no great admirers of the latter, we think—or if we before doubted it, we are now convinced by this example that it may be turned to very good account for such subjects, where some degree of the fantastical may suitably be indulged in; more especially if the style be treated, as it is here, with some degree of artist-like feeling and freedom, and not restricted to the copying indiscriminately what is bad and what is good in it. The architect (Mr. F. Hering) has retained the latter; availing himself of the playfulness and capriccio character of the style, yet also refining it, and divesting it of much of its uncouthness. We certainly, therefore, do not agree with what is said in the "Literary World" in regard to the lowness of the pedestals to the columns, which is there adverted to as a fault, for we consider the extravagant height given to pedestals in proportion to their columns, whereby the latter are rendered quite petty parts in the general design to be one of the errors of that style which is here followed; while to affect scrupulous attention to precedents notoriously licentious in themselves, must be allowed to be a singular sort of correctness and purity. On the other hand, we are of opinion the design would have been materially better than it now is, had all the termini figures been on the same line, instead of some being placed immediately under the cornice, and others lower down.

On the whole, however, we consider this shop-front to exhibit a decided improvement upon the usual system, and would so far recommend it as an example, let the particular style of decoration be what it may. It is not spoken of in Candidus' "Chapter about Boutiques, &c." in Fraser's Magazine of last December: but in fact it was not then visible, not having been completed until several weeks after that article appeared in print.

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SPECIFICATION OF THE MAIDENHEAD BRIDGE OVER THE RIVER THAMES, ON THE GREAT WESTERN RAILWAY.

[CONCLUDED FROM PAGE 30.]

BRICKS.—The bricks used in the main arches, as hereafter described, to be all best picked paviers', and, in every respect of form and hardness, to be of the choicest quality. All the other bricks, to be used throughout the work, to be sound, hard, well-burnt, and well-shaped stocks, of the best quality, and in every respect equal to the sample exhibited in the yard of the Company's Office at Hanwell, and which sample will be kept for the purpose of comparison during the whole work. The best to be carefully selected for the exterior work, and attention to be paid that those be of one uniform colour and general appearance.

MORTAR.—The mortar to consist of one proportion of lime, measured dry, and two, or two and a half, or three, of sand, as the engineer may direct, according to the part of the work where it may be used. The lime to be of the best Dorking, or other stone lime of equal quality to the best Dorking lime; to be slaked, and then ground and worked under edged stones, with as small a quantity of water as may be sufficient to work it into a perfectly smooth soft paste, then to be thoroughly mixed with the required proportion of sand and water in a pug mill.

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ROMAN CEMENT.—The cement to be of the best quality, to be used fresh, and to be well mixed with sand in such small quantities as may from time to time be required, in the proportion of one of cement to one or one and a half of sand, as the engineer may direct, according to the part of the work where it is to be used.

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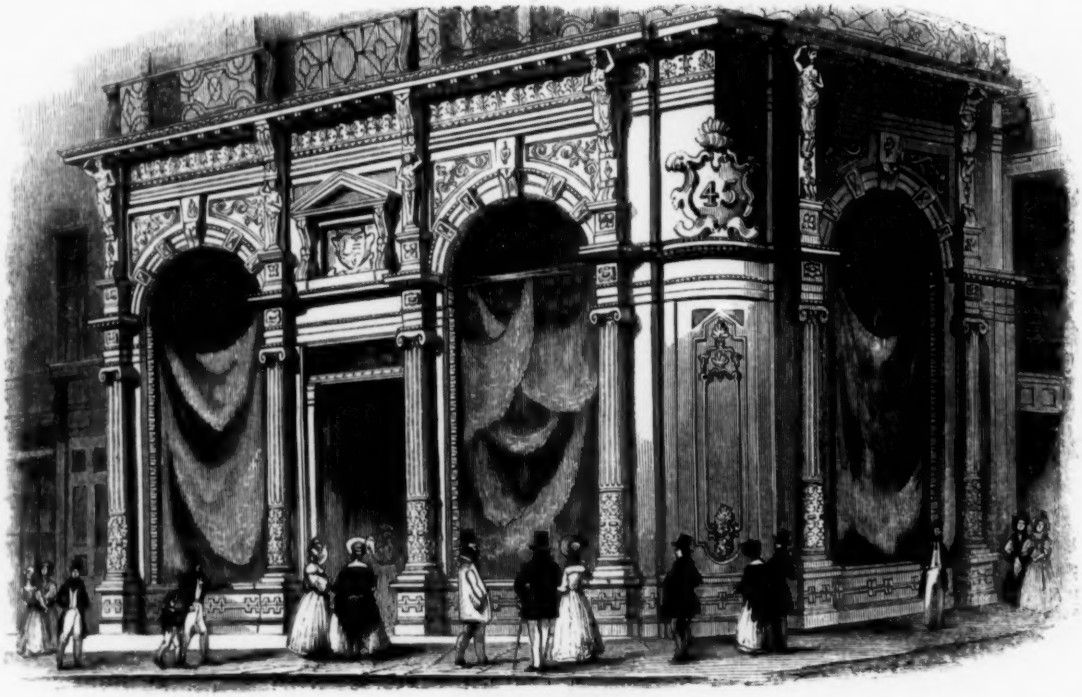
STONE.—The stone to be of the Bramley-fall, Forest of Dean, or other freestone of equal quality, approved of by the engineer, to



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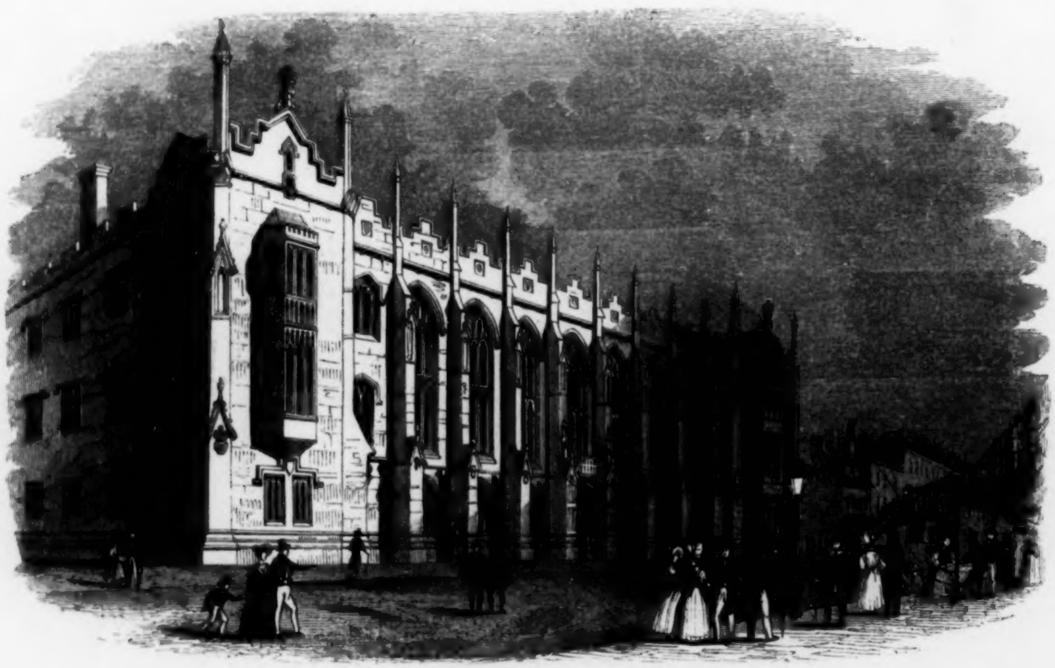

KING EDWARD'S SCHOOL, BIRMINGHAM.

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[Concluded from Page 30.]

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The mortar must be mixed in the pug mill with as small a quantity of water as may be sufficient to reduce it to the consistency required for building, but no water shall be added to the mortar on any account after it has once passed through the pug mill.

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Stone.—The stone to be of the Bramley-fall, Forest of Dean, or other freestone of equal quality, approved of by the engineer, to

be of the best quality of the particular sort approved of; to be of good colour, free from stains, beds, and other defects.

The landings forming the floor of the road to be of the best Yorkshire paving, not less than five inches thick, and without fault or beds in that thickness.

In case of wet weather, the work must, whenever it shall be necessary, be completely covered; and no work which shall appear to have suffered in any way from these or any other causes will be allowed to remain.

Concrete.—The concrete to consist of five parts of clean gravel, perfectly freed from loam or clay, with a proper proportion of small gravel as well as large, and one part of lime, measured after it is slaked and screened; the lime to be mixed into a perfectly smooth uniform paste, as for the mortar, but with more water, and then thoroughly mixed with the gravel.

Sand.—The sand to be clean sharp river sand, free from any vegetable substance, and well screened.

Workmanship.—Brickwork.—The bricks to be bedded sound, without striking after they are once bedded; the mortar to be used sufficiently thin in the interior of the work to enable the workman to flush the joints up full and sound without grouting, and no grouting whatever shall be used in any part of the work, unless especially directed by the engineer. The bricks in each course to be well bonded, and the different courses, &c., to cross joint, so as to make the most sound and perfect work; and the joints throughout the work to be kept as thin as possible consistently with sound work, and the joints well pointed with mortar prepared for the purpose. No batts to be used in any part of the work, unless when it may be necessary for obtaining the required dimensions to the different courses.

Stonework.—The exterior faces of all the stonework to be fair tooled; the beds and joints to be fine picked with a chisel draught of an inch and a half wide all round.

Cornice.—The stones of the cornice to be at least three feet and a half in length, and to average not less than four feet; the two cornices to cross joint at least eighteen inches, and each stone of the upper course to be cramped at the back to the stone of the lower course, by a cast-iron dove-tailed cramp, seven inches long, and two inches square at the smaller part, let in one half to either stone, into a dove-tailed hole, and well bedded in Roman cement; the stones of the lower course to be cramped longitudinally to each other by similar cramps.

The parapet walls to be built in Roman cement.

The coping stones to be at least three feet six inches long, and to be cramped to each other in the same manner. A throating of one inch to be cut in the underside.

The cornice and parapet walls are not to be placed until the centerings of all the arches have been struck for at least three weeks.

Flooring.—The flag stones to be at least 5 inches thick, and of sufficient length that every alternate one may cover two-thirds of the width of the top of the spandrill walls, so that in the plan the ends of the alternate stones will cross each other by 18 inches.

These stones to be dressed at the joints, so as to fit, and to be bedded in Roman cement, and the joints carefully filled in and pointed in cement.

Particular Instructions as to Quality of Work in different parts.—The main arches, to the extent distinguished by a light yellow colour, and marked P P in the section drawing, No. 2, to be built in paviers'; the joints to be kept as thin as possible consistently with perfectly sound work, and no batts to be used. Great care must be taken in dressing the lagging to the proper curve, and laying the lower course of bricks perfectly true, so that when the centering is removed there may be no irregularity of surface.

The exterior nine inches of all the brickwork of the centre pier —of the west abutment, and of the piers of the land arches on the west side,—and of all that part of the eastern abutment which may be exposed to the flow of water, shall be built of paviers', and set in Roman cement, and the joints well pointed; and the whole of the external work of the bridge, between the limits A A, drawing No. 3, shall be faced with paviers'.

That part of each abutment distinguished by a brown tint, and marked C C, drawing No. 2, will be built of stocks, and set in Roman cement; the rest of the work, marked S S, being of stock bricks, set in mortar.

That part of the concrete, shown in drawing No. 2, which is upon the abutments, must be filled in as soon as possible, in order that it may be perfectly set before easing the centres of the main arches. The concrete over the land arches must be filled in before striking the centres of those arches.

The three upper courses, or nine inches, of the upper work of the interior spandrill walls, shall be built in Roman cement.

Time of Completion.—The work shall be commenced within ten days of the date of a notice given to that effect by the contractor.

The wing walls at either end, and the land arches and the concrete upon them, shall be completed ready to receive the materials of the embankment, which is to be formed to connect with the bridge under a separate contract within twelve months of the date of such notice; and if the work be not completed so as to allow of such formation of the embankment, the contractor shall pay to the company a penalty of £50 for each week after such time, and until the work shall be ready to receive the embankment.

The interior spandrill walls shall be built, and the Yorkshire landings laid upon the walls, or so much of the flooring shall be completed as may be sufficient to lay two lines of temporary rails across the bridge; and the company or parties contracting under them shall be enabled to carry materials across the bridge in eighteen months from the same date; and if the works shall not be so far completed as to allow of such carriages of materials at the time specified, the contractor shall pay to the company a penalty of £100 for the first week, and £150 for the second week, making £250 for the two weeks, and £200 for the third week, making £450 for the three weeks, and so the penalty for each successive week increasing by £50; and all centerings, coffer-dams, and scaffoldings, shall be removed, and the work in every respect be completed within twenty months after the date of the notice, under a weekly penalty similar to the last mentioned; and the payment of any such penalties shall not in any way relieve the contractor from the payment of any further penalty or deduction from the money to be paid to him to which he may become liable by the terms of this contract.

The contractor is to maintain the whole of the permanent works hereinbefore specified, and to leave the same in perfect repair twelve months after the completion of the work.

General Stipulations.—The drawings are to be considered as giving the general forms and character of the works which cannot be described in the specification; but all dimensions given in the specification are to be taken in preference to dimensions written on the drawings, and written dimensions on the drawings in preference to dimensions by scale.

The contractor must satisfy himself upon all matters which can in any way influence his contract; and no information upon any such matters, derived from the drawings or specification, or from the engineer or his assistants, will in any way relieve the contractor from all risks, or from fulfilling all the terms of this contract; and as there may be details and incidental works not particularly mentioned in the specification, the contract-sum is to include all such items, whether in the temporary or in the permanent works, as may thus have been omitted, which can fairly be considered as omissions, or which must evidently be required by the nature of the work included in the contract. He is to find all the materials and implements, and to execute all the works requisite for the perfect completion of the bridges and works connected therewith, according to the true intent and meaning of this specification, as well as such extra works, above described or referred to, as may be required by the engineer.

The whole of the works herein specified, as well as the mode of execution, are to be to the entire satisfaction of the engineer for the time being; and he is to have the power of altering, enlarging, or diminishing the quantity of work to be performed, deductions for diminishing and additions for additional work being made pro-rata, according to the prices to be by the contractor inserted in the scale hereunto annexed. And the contractor is to comply with every order given by the engineer, both as to the quantity of work to be performed and the manner of doing the work; and no work, otherwise than hereinbefore specified, is to be undertaken unless by an express order from the engineer in writing for that purpose; and should there hereafter appear to be any discrepances between the

scale attached to the drawings and the written dimensions, or between the drawings and specification,—or should there be any difference of opinion as to the mode of carrying on the work, as to the workmanship, or anything touching the execution of the work, or as to the meaning of any clause, matter, or thing, in this specification or the drawings annexed, the same is to be referred to the said engineer, and his decision shall be final.

If during the progress of the works, or within twelve calendar months after its completion, any imperfection should appear in any part of the work, or any accident should occur, whether from frost, bad weather, or from whatever cause such imperfection or accident shall arise, and notwithstanding any certificates which may have been given to enable the contractor to obtain payment for work supposed to have been properly completed, it shall be immediately repaired and made good at the contractor's expense, to the satisfaction of the engineer; and should the contractor not comply with such orders as may be given to him from time to time by the engineer, or not proceed with sufficient expedition in the performance of the works as directed, it shall be in the power of the company to take the work wholly or in part out of the contractor's hands, and to employ any number of other workmen, or additional materials, to complete the same; and whatever extra expense may thereby be incurred by the company in completing the work in a proper manner, and with proper expedition, shall be defrayed by the contractor; and if at any time the company shall find it necessary to take the work entirely or in part out of the contractor's hands, or put on additional workmen, or to supply additional materials to expedite the work, or to enforce its proper execution, the company shall have full power to take possession of the whole or such part of the materials, tools, or implements used by the contractor, which the company's engineer may consider requisite for carrying on the work. And, lastly, the contractor must take upon himself the entire responsibility of the sufficiency of the centering, scaffolding, coffer-dams, and generally of all the means used for the fulfilment of his contract, whether such means may or may not be approved of or recommended by the engineer of the company; and the contractor must run all risk of accident or damages whatsoever that may arise either to the works, or by reason of the execution of the works, until he shall have fulfilled all the terms of his contract.

All work to be measured and estimated according to the net contents when completed, and without any allowance for circular or other work, notwithstanding any custom to the contrary.

No work to be considered complete unless performed within the time specified, and to the satisfaction of the engineer, and certified as such by him, and the contract not to be considered as fulfilled until the entire completing of the works and the expiration of the term during which the whole work is to be kept in repair.

Mode and Time of Payment.—The work will be measured up or estimated by the engineer or his assistant every four weeks; and upon a certificate being given by the engineer of his estimate of the value of such work as may be completed according to the terms of the contract, including any extra works, such value being calculated from the measurement or estimated quantities of the work then completed, and in proportion to the total amount of the contract and the scale of prices annexed thereto, 80 per cent. of such value will be paid to the contractor, the remaining 20 per cent. upon each payment being retained by the company until the completion of the work, as additional security to meet any claims upon the contractor until such time as the total amount of the sums so retained shall amount to £2000, after which time, and upon a certificate being given by the engineer of the value of any work completed, the whole amount of such value will be paid to the contractor; and within one month after the completion of the whole work, according to all the terms of the contract, and upon a certificate being given by the engineer to that effect, the whole sum due, according to the certificate of the engineer, excepting £1000, will be paid to the contractor, this £1000 being retained as additional security until the entire fulfilment of the contract, including the maintaining of the works in repair for twelve months, at the expiration of which period, and upon a certificate being given by the engineer of the perfect state of the works, the £1000 will be paid to the contractor.

Form of Tender.—All tenders must be upon printed forms, which will be furnished to parties applying for them, and must be signed by two or more responsible persons offering to become security, jointly and severally with the parties tendering, to the amount of £4000, that the contract with all its stipulations shall be fulfilled.

The parties tendering must name a gross sum for completing the bridge with the works connected therewith, and keeping the same in repair for twelve months, as specified.

With a scale of prices for the works specified, from which the allowance for extra works or for additions to or diminutions from the contract work will be completed.

IMPORTANCE OF PHOTOGENIC DRAWING TO ARCHITECTURE.

Prodigious was the noise made about Daguerre's invention on its first coming up: it was spoken of everywhere, but, although described as about to establish an entirely new era in the graphic art, or rather as superseding the manual operations of the artist, comparatively little notice was bestowed upon its actual results; instead of which, a great deal of idle wonderment was expressed in regard to the mere discovery, with some doubt, also, as to whether it really originated with Daguerre himself, or the honour of furnishing the idea of it ought not to be given to our countryman, Talbot. After people, however, were tired of wondering at it as a miracle, it seems to have been in a manner forgotten, for latterly it has excited little attention; and we have heard those whom we have questioned respecting it pronounce it a mere piece of humbug,—very curious, perhaps, as a mere scientific discovery, but otherwise altogether valueless; which opinion seemed to us to be confirmed by our finding that after so long a time no practical application appeared to be made of it.

Our previous scepticism is now entirely removed by a collection of specimens of Photogenic drawing we have just viewed at Messrs. Claudet and Houghton's, the agents for the sale of them, 87, Holborn, and which, though they do not answer to the idea previously conceived of them as drawings, at once convinced us that the invention has not been at all overrated, or rather not at all done justice to, as regards its importance for obtaining accurate delineations and copies of buildings, statues, and other objects of that description, where perfect fidelity to the originals constitutes the most valuable recommendation. Those who look chiefly to the mode of repesentation are likely to feel disappointed after their mere curiosity is gratified, for the reason that, being on a highly polished metal surface, such delineations more resemble an engraving on a steel plate than an impression from one, or a drawing; added to which, the glare of the metal is offensive and wearying to the eye, and renders it necessary that the plate should be held in such a manner that a person does not see his own face reflected in it instead of the subject. Besides which inconvenience —or convenience it may be to many, as they can contemplate themselves while apparently interested in something else—the effect of chiaro-oscuro is almost lost, the shadows appearing faint, and of a uniform tone. There are, likewise, several other circumstances, which, unless they can be removed, will prevent Photogenic drawings from becoming so popular as was first predicted of them: these are, their expensiveness, and the room they occupy. In time, perhaps, some reduction of price may be afforded, yet such drawings must always be dearer than engravings, or impressions from plates, though the latter will doubtless appear preferable to persons in general, because each drawing of the kind must be upon a silvered plate of metal, fixed upon a panel, and covered by a glass; whereas, thousands of impressions may be taken from a single steel plate, the material required for each being only a piece of paper. The specimens we saw were nearly all of the same size, about 8 or 9 inches, by 6, yet vary as to price, from two guineas to eight, and that, too, in some instances where the subject was the same; the price put upon them being regulated by the successfulness of the operation, which, it seems, cannot be uniformly insured, but depends in a great measure upon circumstances beyond the operator's control. No doubt considerable skill and practice are required on his part, consequently it is a very great error to suppose, as some at first did, any person might, without any trouble, take views of as many objects as he pleased, while travelling,—all the preparations, together with the cost of conveyance of metallic

plates for the purpose, being quite left out of the account. Even those to whom price is no object,—perhaps, rather a recommendation,—will, we suspect, be contented with a few specimens of the kind, as many of them would occupy a great deal of room, and require to be kept in cabinets fitted up with shallow drawers, labelled in front with the subjects they contain. We know of no other arrangement by which a collection of several hundreds—which if prints might be contained in a few folios—could be conveniently disposed: as to hanging any number of them up in frames, that is quite out of the question, because each subject requires to be closely inspected, and examined with a lens.

Having thus far fairly stated disadvantages which must place drawings of this description beyond the attainment of persons of limited means, we shall now, with equal impartiality, bear testimony to their extraordinary advantages, more especially in the delineation of buildings and works of art. Pictorial effect, indeed, is not to be looked for; but then they give us what is of infinitely more importance,—what renders them invaluable as such studies,—the most perfect fidelity, unerring correctness, a fac simile of the original, the truth of which cannot be even suspected. Those who know what even the better class of architectural drawings and engravings for the most part are will be able to appreciate such merit with grateful admiration. In the very best drawings of the kind there is almost invariably something to desiderate; not indeed as regards effect and spirit, but because veracity is more or less sacrificed to those qualities, and to the alluring *furberia* of the pencil; whereas we hold truth in their portraiture to be almost a *sine qua non* in such subjects, and that delusion, however fascinating, is still delusion and untruth. One license in which architectural draftsmen are apt to indulge is that of making their figures smaller than they ought to be, in order to give greater apparent magnitude to their buildings: yet what is this but falsehood?—for we are just as much deceived and misled by draftsmen making columns thirty feet high to appear forty or fifty, as we should be by a writer's stating the latter dimensions instead of the former.

In addition to general fidelity, Photogenic drawings give us what is beyond the power of the most skilful and patient artist, namely, all those minutiæ of details which can be made out only by close inspection, consequently become indistinct, or else quite disappear at such a distance as is requisite for taking a view; and which yet are, nevertheless, rendered visible in a Photogenic image, when a lens of sufficient power is applied to it. And so far the Daguerrotype may be said to have accomplished an impossibility, and accomplishes perfectly in about twenty or thirty minutes what it would occupy an artist almost as many days to delineate in a comparatively very imperfect manner. Another great recommendation is unerring truth as to perspective, in regard to which many otherwise clever and able occasionally commit very serious errors: neither is it the least recommendation of all, that in a Photogenic drawing a building cannot possibly be made to appear otherwise than as its locality allows it to be seen; whereas a most unwarrantable degree of license in this respect is frequently taken, and buildings situated like St. Paul's are represented as if they could be viewed from a distance, and stood quite in an open space.

The subjects we saw were chiefly views of buildings at Paris, and among them were the Pantheon, two or three different ones of the Arc de l'Etoile, the centre of the east façade of the Louvre, the Church of the Invalides, and the Porte du Chateau d'Anet, an elegant production of the Renaissance style. Nothing can exceed, or rather approach to, the exquisite truth and beauty with which the sculptures show themselves in the pediments of the Pantheon and Louvre, and in the Arc de l'Etoile, or the wonderful precision with which the flutings of columns, and the most delicate carvings of capitals, are rendered. But we were most of all struck by a "still life" composition of architectural fragments and sculpture. For objects of this class,—for producing fac similes of the chefs d'œuvre of sculpture and other master-pieces of art, which seem hitherto to have baffled every attempt of the pencil to transcribe them in all their excellence, the Daguerrotype may be pronounced an invention beyond all price. We behold the objects as in a mirror, but permanently fixed on its surface.

Indeed, we have no doubt, after what we have seen, but that within a short time the use of the Daguerrotype will almost supersede the pencil of the draftsman in taking views of buildings intended to be engraved from; if merely on account of the saving, both as to cost and to time, that would be effected by it; because although drawings of this kind are dear in comparison with prints, they are cheap as original delineations intended to serve as copies for the engraver. Of course engravings taken from them can show no more detail than is visible to the naked eye, but, if faithfully transcribed, even that would be infinitely superior to almost anything yet produced: and when once accustomed to correctness of architectural drawings, the public will hardly tolerate the inferior works it now encourages. We therefore now rather confidently anticipate much good, either sooner or later, from Daguerre's invention. Besides which, although Photogenic plates themselves can never find a very extensive market, collections of them will doubtless be formed by those among the architectural profession who can very well afford to gratify their taste, and accumulate such valuable studies and documents.

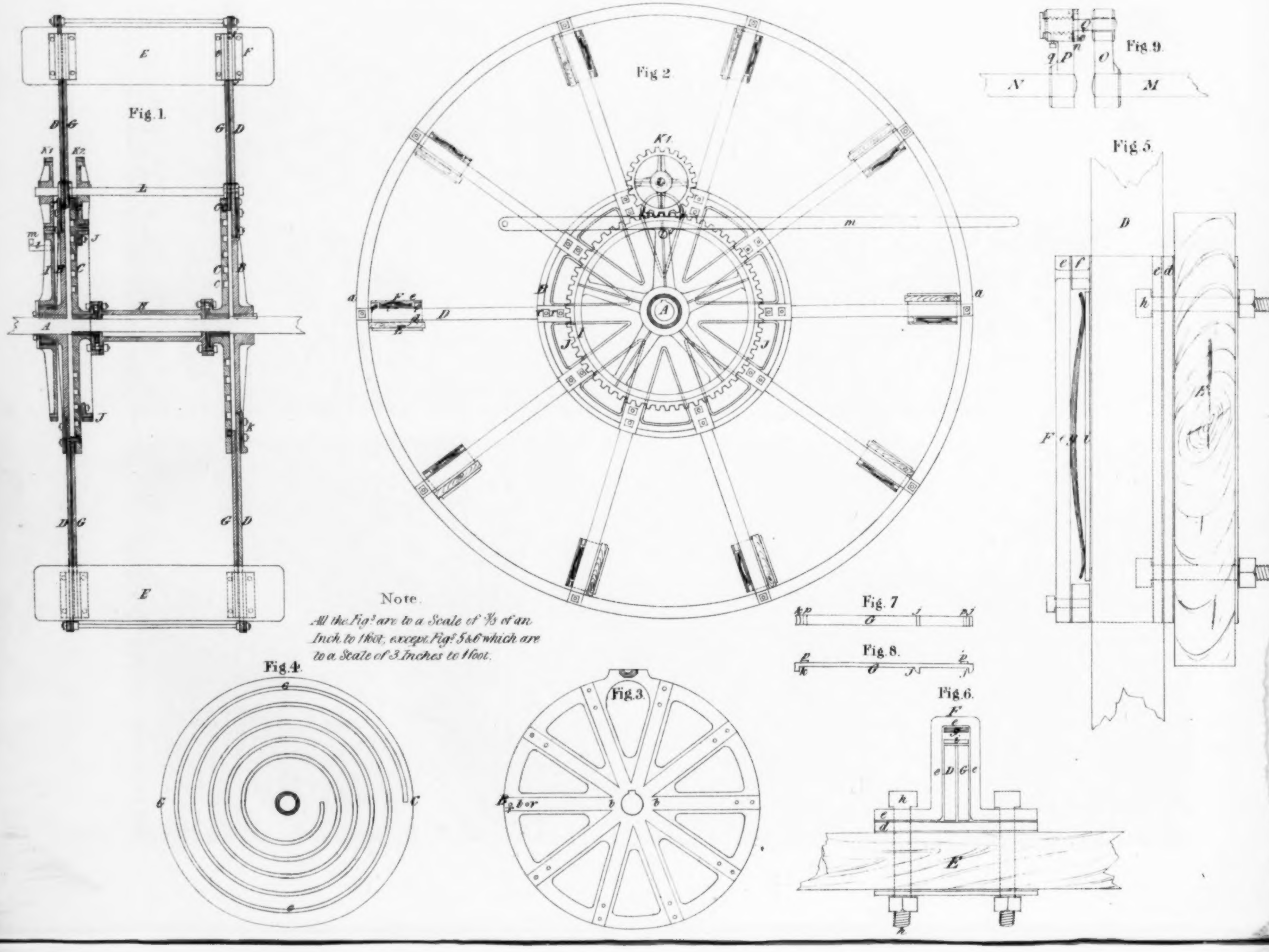
FLOATING BRICKS.

TO THE EDITOR OF THE SURVEYOR, ETC.

Sir,—You must be aware as well as I that the ancients were in possession of a method of making bricks which, though they had very considerable strength and remarkable power of resisting heat, were yet of such small specific gravity that they floated on the surface of water. Pliny says expressly that they were made at Pitane, in Asia, at Marseilles, and at Colento, in Spain; and used for various purposes, especially in the construction of buildings on the decks of large galleys. Like many of the more splendid arts of the ancients, the material of those bricks was unknown, and the method of making them lost, for a number of years. About the year 1790, or perhaps a little earlier, Fabbroni, an Italian, turned his attention to the subject, and, after various experiments upon different minerals of small specific gravity, he at last discovered that these bricks must have been composed of the substance called "mountain meal;" or, at all events, he found that he could make of this substance bricks which, in as far as the details are handed down to us, agreed in every respect with those described by the ancients. This mountain meal is an earth which, upon analysis, M. Fabbroni found to contain 55 parts of flint earth or silica, 15 of magnesia, 12 of clay, 3 of lime, 1 of iron, and 14 of water. The bricks which he formed of this material had the property of floating in water, and many other valuable properties besides. They could not be fused by any ordinary degree of heat; and so low was their conductive power, that while one end of the brick was red hot, the other could be held in the hand without the smallest inconvenience to the person holding it. There is no reason whatever to doubt the truth of Fabbroni's statement, or the fact that he found this mountain meal in great abundance near Casteldelprano, in Sicily. Now, what I wish to know from you, or from some of your correspondents or readers, is, whether this mountain meal is chemically the same as the substance under that name which is so plentiful in Cornwall, and which is not unfrequently used in adulterating the flour of wheat. In this adulteration, though a fraudulent, it is by no means a deleterious substance; but if it is identical in its chemical composition with the mountain meal upon which M. Fabbroni made his experiments, it could be turned to many very useful purposes, without any fraud whatsoever. It possesses three very valuable qualities:—First, its small specific gravity; secondly, its infusibility by fire; and, thirdly, its very low conducting power. All these render it a most eligible material for every erection on shipboard, in which fire is to be in any way employed,—as, for instance, in the cooking apparatus of all descriptions of craft, and in the furnaces of steam vessels. For such it is better suited than any of the descriptions of brick now in use, not only because it is fully one-half lighter in an equal bulk, but also because it is less destructible by fire, and a better guard against the fire's destroying anything around it; because, though building with this material is only the length of a single brick in thickness, it can bear to be kept red hot on the inside, while the outside, instead of charring, would not greatly heat timber, though in immediate contact with it. It might also be found a very valuable material for packing, between the cylinders of steam-engines and their external cases.

In short, the three properties which I have named, and of which

S. HALL'S PATENT REEFING PADDLE WHEELS.



Note.

All the Figs. are to a Scale of ⅔ of an Inch to 1 foot, except Figs. 5 & 6 which are to a Scale of 3 Inches to 1 foot.

the experiments of Fabbroni have shown it to be possessed, will point out to such as are conversant with the engineering arts very many useful purposes to which this description of brick, or of brick earth, might be applied; and, besides those actually useful ones, it might also be made to answer many purposes of pleasure. I shall mention only one, and that is, the construction of floating houses upon ornamental waters. At present, such structures can be made only of timber; and, paint them up as the owner may, there is always a flimsy and unsubstantial air about them, and the weather has a powerful effect upon them. If, however, a wooden platform were employed as the base of the whole, and the weight so contrived as to keep this platform constantly under water, it would, if made of proper timber, last a very long time. Then the upper part of the structure, formed of these floating bricks, might have all the appearance, and, indeed, almost all the real stability of a brick house upon land; for this description of brick is as durable against the influence of the atmosphere as it is against fire; and, although it is not absolutely so strong as the heavy brick in common use, it is far more so in proportion to its specific gravity. M. Fabbroni, in his very small work upon the subject, published at Florence in 1791, states that these bricks are very little inferior in strength to common bricks. If they are desired to be stronger, one twentieth part of allumina or pure alloy may be added to their composition, without lessening their buoyancy in any material degree. The proportion of their weight in bricks seven inches long, four and a half broad, and one inch and two-thirds in thickness, was found to be 5 pounds 6¼ ounces, in compact common brick, and only 14½ ounces in the floating brick. Notwithstanding this, these bricks unite with lime and resist water as well as the common bricks do, and they may be used either unburned or burned. In burning they shrink very little, far less indeed than common bricks, though they lose ⅕ of their weight, and acquire a sonorous or ringing quality. Altogether this combination of earths is a very curious and interesting subject; and not the least advantage which it possesses over timber, is its perfect indestructibility by fire. These are the reasons why I am so anxious to ascertain whether the mountain meal of Cornwall is an analogous substance, or whether it could be rendered so by any admixture.

AN ENGINEER.

SAMUEL HALL'S PATENT REEFING PADDLE WHEELS.

THE reefing paddle wheels have been the subject of several patents, and have successively occupied the minds of many eminent engineers and scientific men, but hitherto, if we except the partial success of Watt, their attempts have all signally failed, chiefly from the want of simplicity in their arrangements for moving the float boards, and the rapid corrosion of the moving parts by sea water. Mr. Hall's plan for accomplishing this object is at once simple and effective, presenting scarcely any more parts to the corrosion of the sea-water than the common paddle-wheel, and, by the mere application of a hand lever, the power of the engine will, in less than a minute, without regard to weather, withdraw the whole of the floats from the extremity, close up to the boss of the wheel, or to any intermediate distance, to suit the immersion of the vessel. In the accompanying plate will be found the whole of the details of this important invention, and the description in the accompanying specification of the patent. At the end of this article will be found the result of Mr. Hall's experiments on the Thames, with the Lee steam barge, fitted with the reefing paddle wheels, which are as satisfactory as every friend of improvement could wish.

COPY OF THE SPECIFICATION.

To all to whom these presents shall come, I, Samuel Hall, of Basford, in the county of Nottingham, Civil Engineer, send greeting: Whereas, Her present most excellent Majesty, Queen Victoria, by her Letters Patent, under the Great Seal of Great Britain, bearing date at Westminster, the seventh day of October, in the third year of her reign, did, for herself, her heirs, and successors, give and grant unto me, the said Samuel Hall, her especial license, full power, sole privilege, and authority, that I, the said Samuel Hall, my executors, administrators, and assigns, or such others as I, the said Samuel Hall, my executors, administrators, or assigns, should at any time agree with, and no others, from time to time, and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend within England, Wales, and the town of Berwick-upon-Tweed, and also in all her said Majesty's colonies and plantations, my invention of Improvements in propelling. In which said Letters Patent is contained a proviso that I, the said Samuel Hall, should cause a particular description of the nature of my said invention, and in what manner the same is to be performed, to be enrolled in her said Majesty's High Court of Chancery, within six calendar months next, and immediately after the date of the said in part recited Letters Patent, as in and by the same reference being thereunto had, will more fully and at large appear. Now know ye that, in compliance with the said proviso, I, the said Samuel Hall, do hereby declare that the nature of my Inventions, and the manner of which the same are to be performed, are fully described and ascertained in and by the following description thereof, reference being had to the drawings hereunto annexed, and to the figures and letters marked thereon, that is to say:—The objects of my improvements in propelling consist, First,—In the withdrawing of the float boards more or less from the peripheries of paddle wheels towards their centres, and in the returning of them back again at pleasure, for the purpose of regulating the depth of their immersion in the water wherein the vessel to which they are applied is floating, according to circumstances, such as the depth of water the vessel is drawing, the roughness of the sea, the violence of the weather, or any other occurrences which may take place to render such variations of the situation of the float boards desirable. Secondly,—Not only in the regulating of the float boards, as above described, but in the withdrawing of them entirely out of the water, or as nearly so as possible, when any circumstances render it desirable, such, for instance, as when the wind is so favorable as to render it desirable to sail the vessel entirely thereby, and to cease altogether during that time from working the engines; and, when that is no longer the case, in the returning of the boards to their proper situations in the water, for the engines to be again put into operation.

Having stated the objects of my invention, I now proceed to describe the modes by which they are respectively obtained, reference being had, as before mentioned, to the drawings, and to the letters and figures marked thereon; the same letters showing the same parts of the apparatus and machinery, respectively, in all the figures.

Figs. 1 and 2 are drawings of the paddle-wheel with my improvements applied thereto. Fig. 1 being a section of it taken through its centre in the direction from *a* to *a* in fig. 2. Fig. 2 is a view or elevation on the side next the vessel, except as to the slide boxes, *F F*, hereafter described, which are shown in section, *A A*. Figs. 1 and 2, show the paddle-wheel shaft. *B B* are the wheels, one of which is shown separately at fig. 3, to receive the paddle arms, such wheels being firmly fixed upon the shaft; *b b* are straight grooves in the arms of the wheel (the grooves being as much deeper as the thickness of the arms at the ends of the grooves most remote from the centre of the wheel, to receive such arms), which are to be firmly affixed in the deepened ends by bolts, *r r*. The grooves are consequently rendered of a uniform depth from end to end by being thus filled up at the deepened ends by such insertion of the paddle arms. *C C* are other wheels (one of which is shown separately at fig 4) having grooves, *c c*, in them of a spiral form. *D D* are the paddle-wheel arms bolted, as before mentioned, into the outer and deepened ends of the grooves, *b b*. *E E* are the float boards which are to move towards or from the centre of the wheel, as and when required; being fixed upon the arms with proper tightness by slide boxes, *F F*, one of which is shown separately in section at figs. 5 and 6, the former figure being taken through the middle of the box lengthwise, and the other figure through it crosswise, or transversely; they consist of a metallic plate, *d d*, which forms the bottom of the box, and of another metallic plate, *e e*, which is constructed so as to form the sides and top of the box; *f f* are two blocks of steel or other suitable material affixed within and at each end of each of the boxes to fit as accurately as possible upon the paddle arms so as to allow the boxes to slide thereon, and between these blocks is inserted within each of the boxes a spring, *g*, of hammered brass or other suitable material to cause the boxes, and of course the float-boards, which are attached thereto by bolts, *h h*, figs. 5 and 6, to slide steadily along the arms, and bear with considerable firmness thereon. Plates of steel, *i i*, or other suitable material, are inserted loose

within the boxes between the arms and the springs, to prevent the wear of the latter, which would take place, if, when sliding, they were to come in contact with the former. *G G* are flat sliding bars shown separately at figs. 7 and 8; the former figure showing the flat side, and the latter the edges of them. They are for the purpose of moving the float-boards toward and from the centre of the paddle-wheel: one end of each of these bars enters into the slide box, *F*, in which they are secured by two strips of metal, *j j*. There is another strip of metal, *k*, at the other end of each bar, of a curved form, to enter and traverse in the spiral groove, *c c*, hereafter mentioned; there are also two other strips of steel or other metal *p p* on the other sides of the said bars, to keep them from bearing upon the paddle arms, *D D*. The spiral grooves of the two wheels, *C C*, must exactly correspond with and face each other, so that when the metallic strips, *k*, of one set of sliding bars are brought as near to the centre of the paddle-wheel as the grooves will allow, the other set in the other wheel shall be in a corresponding situation. Thus, in that situation, as well as in all others, the two wheels containing the spiral grooves which are connected together by the coupling box, *H*, will cause the strips, *k k*, and of course (through the means of the sliding bars) each end of the float boards, respectively, to assume a corresponding situation.

It will be apparent that when the spiral wheels, *C C*, turn round along with the arms and other parts of paddle-wheel, the boards will not have any traversing motion given to them towards or from the paddle-wheel shaft. But it will be evident that, if on the one hand, the two spiral wheels be put in motion while the paddle-wheel is at rest, or, on the other hand, if the two spiral wheels be retained at rest while the paddle wheels are in operation, the float-boards may be moved inwards or outwards by means of the curved strips of iron, *k k*, traversing in the spiral grooves, *c c*, and thereby moving the slide bars, *G G*, and the float-boards with which such bars are connected as above-mentioned by the slide-boxes, *F F*. In order, therefore, to effect the sliding of the float-boards, either while the engines (and of course the paddle wheels) are in motion, or while they are at rest, I apply the toothed wheel, *I I*, which can move round freely on the paddle-wheel shaft, and the toothed rim, *J J*, of the same size and pitch as the toothed wheel, this toothed rim is bolted to one of the spiral wheels, *C C*, and this toothed wheel and rim are then connected together by means of the two small toothed wheels, *K* 1 and *K* 2, which are keyed on the cross shaft, *L*. When the float-boards are required to be put in motion, while the paddle-wheel is standing still, a winch or handle is to be applied at either end of the cross shaft, *L*, which are made square to receive it. By turning this shaft the wheels, *K* 2, will turn the spirals, *C C*, round in either direction, and thereby move the float-boards inwards or outwards, as may be required. But in order to move the float-boards inwards or outwards while the paddle-wheels are in operation, a stud pin, *l*, is fixed on the loose toothed wheel, *I I*, and a lever, *m*, with a projection upon it, is applied for the purpose of being pressed upon the stud pin, whereby the wheel, *I I*, is stopped, and by its connection with the wheels, *K* 1, and, *K* 2, and the toothed rim, *J J*, the spiral wheels, *C C*, are retained in a state of rest, so that the motion of the paddle-wheel shall cause the curved strips, *k k*, to traverse in the spiral grooves, *c c*, and thereby move the float-boards, as already described, inwards or outwards, according to the direction of the motion given to the paddle-wheels.

When it is desirable to draw or reef the float-boards out of the water, or close up to the wheels, *B* and *C*, for the purpose of propelling the vessel by wind instead of steam, or for any other reason, the paddle-wheel shaft may readily be disconnected from the middle shaft by the following means, which I have devised for that purpose. Fig. 9 shows a paddle-wheel shaft, *M*, coupled with the middle shaft, *N*, by cranks, *O* and *P*, and a crank pin, *Q*; this pin is tapped or screwed at one end, whereby it is firmly screwed into the arm of the crank *P*, and is kept from unscrewing by a set screw, *q*, or any other proper means. The other part of the pin which is not tapped or screwed, passes with proper freedom into the other crank arm, *O*, and the connecting rod of the engine, which is not here shown, is fixed in the usual manner on the pin, *Q*, between the two crank arms. There is a round steel, or other metallic plate, *n n*, attached by screws with counter sunk heads, *o o*, to the inside of the boss of the crank arm *P*, in the centre of which plate there is a hole precisely the size of the untapped part of the pin which passes through it, and is held steady by it when the crank arms are not connected together by it. When the shaft *M* is required to be disconnected from the shaft *N*, the paddle-wheel must by any suitable means be held in a state of rest, which, in consequence of the float-boards being taken out of the water will be easily effected. The crank pin *Q* must then be drawn out by unscrewing it until it has left the crank arm *O*, but it must be left projecting so far out of crank arm *P* as to support the connecting rod, and render it unnecessary to disturb its brasses or straps. One end of the pin being held steady by the plate, *n n*, and the other by the tapped part of the pin, which is not unscrewed from the crank arm *P*.

Having thus described the various parts of the apparatus which constitute my improvements in propelling, I now proceed to explain and define the extent of my claims, and that in numerical order, claiming every one of them, independent of each other, as respectively new and useful inventions.

They consist, First, in any suitable inclined or incurvated eccentric surface or surfaces for sliding the float-boards of paddle-wheels inwards and outwards, in whatever manner the inclined or incurvated eccentric surface or surfaces may be formed or applied, whether in the form of a single spiral groove, as shown in this specification, or of two, three, or some other number of spiral grooves, or whether the spiral or spirals be in the form of a groove or grooves, as above mentioned, formed in a wheel or boss, as herein described, or of a spiral or spirals projecting from instead of sinking into such wheel or boss, or in whatever other form it may be applied, it may be proper here to remark, that when the spiral or spirals are in the form or forms of a groove or grooves, only one of the curved metallic strips, *k*, is necessary to be applied to each of the slide-bars to move or traverse in its respective groove, but that when the spirals project from the wheels, *C C*, two such metallic strips are necessary, between which the projecting spirals are clasped, and travels to move the slide-bars inwards or outwards.

Secondly,—I claim the combination of any inclined or incurvated eccentric surface or surfaces, as above described, with the arrangement of toothed wheels herein delineated, or any other suitable arrangement of machinery for putting the inclined or incurvated eccentric surface or surfaces in motion, or for stopping them for the purpose of sliding the float-boards of paddle-wheels inwards or outwards, either while the engines and paddle-wheels are at rest, or while they are in motion, and without the necessity of stopping them, as in the former case, viz., while the sliding of the float-boards is effected, as would be necessary were the inclined or incurvated eccentric surface or surfaces only applied without the arrangement of toothed wheels herein delineated, or some other suitable machinery for effecting the same purpose.

Thirdly,—I claim the slide boxes and the springs herein before described, or any other suitable elastic material for the purpose of attaching the float-boards firmly to the paddle-wheel arms, and, at the same time, of allowing such float-boards to slide backwards and forwards on them with sufficient ease; similar springs or elastic material, the use of which I also claim, may be applied at the sides as well as on the edges of the paddle arms; and I make my claim to this mode of attaching the float-boards to paddle-wheels, whether in connection with my inventions as before described, or not, and whether for moving or reefing them by any other machinery, or by manual labour; and I claim this plan even as a mode of fastening the float-boards, and without moving or reefing them at all.

Fourthly,—I claim the method herein described, of connecting and disconnecting the paddle-wheel shaft and the main shaft, whether in connection with my reefing paddle-wheels, as herein described, or with any other kind of wheels, or mode of propelling, to which such method of connecting and disconnecting the paddle-wheel shafts and engine shafts is applicable.

Fifthly,—I claim the above means of moving or reefing float-boards for water-wheels for propelling machinery, and other purposes, as well as for paddle-wheels for propelling boats, ships, or other vessels.

Sixthly,—I claim the above-mentioned means of sliding the float-boards, whether for the purpose of regulating the depth of their immersion in the water, or for the purpose of taking them out of the water altogether, or as nearly as possible, when required, whether for the purpose of allowing a steam-vessel to be propelled by the wind only, or for any other reason.

I would here observe that I do not limit my claims to the precise means or apparatus, or arrangements thereof, which I have described in this specification, for the attainment of all or any of the various

objects above-mentioned, as they are susceptible of many variations of form and mode of application, which are essentially and substantially the same as those which I have given as instances of my improvements, and the adoption of any of such variations would, as I consider, be as much infringements of my patent as the use of any of the precise means, apparatus, and arrangements which I have herein delineated and described.

In witness whereof, I, the said Samuel Hall, have hereunto set my hand and seal, this sixth day of April, in the year of our Lord, one thousand eight hundred and forty. H.

A pair of Reefing Paddle Wheels of 14 feet diameter have been in operation nearly a month, on board a new iron steam barge, the "Lee." The proprietor, William Lee, Esq., and several other gentlemen, went down in the barge, on Monday, 13th inst., from Blackwall to Rochester Bridge, and returned on the 15th inst.; the performance of the wheels gave the most entire satisfaction to all the parties, and proved the importance of reefing or adjusting the float boards of paddle wheels according to their immersion in the water. The barge went from Blackwall to Rochester Bridge in 7 hours and 18 minutes, being empty, and drawing only 2 feet and 9 inches of water. On her return, she was deeply laden, and drew 5 feet 6 inches of water; she performed the same distance in 7 hours and 51 minutes, being, by means of the reefing wheels, only 33 minutes longer in doing so when deeply laden than when empty; it is, therefore, evident how highly important it is to have reefing wheels to steam vessels making long voyages, and of course greatly varying their immersion in the water.

Among the numerous advantages of these wheels, two may be here mentioned: viz., first, the instantaneous manner in which a steamer may, by them, be converted into a sailing vessel, and vice versa; whereby the whole of the fuel expended during favourable weather is saved, being probably, upon the average, upwards of one-third of the whole consumption. Second, the reducing of the time very considerably (one-third part, it is supposed, at least), now required for performing long voyages. We shall in a future number particularize other very important advantages which will result from the adoption of this wheel.

ENGLAND'S PATENT UNIVERSAL SCREW JACK.

[COMMUNICATED BY THE INVENTOR.]

The above is a perspective view of the Universal Screw Jack. A representing the common lifting jack placed on a strong iron frame B, with the screw C, the whole length of the frame (about two feet) working in bearings at each end, and through the double nut D D, attached to the base of the jack A, the screw C, being worked by the rachet lever E, will cause the jack to traverse the length of the frame, carrying with it any body that may have been lifted by it.

The Universal Screw Jack has been approved of and patronized by the following eminent engineers:—Messrs. J. K. Brunell, R. Stephenson, J. Braithwaite, J. U. Rastrick, E. Bury, and J. Gibbs.

It is particularly applicable to railway purposes, as in all cases it answers the purpose of the common lifting jack, and also embraces the advantage of a lateral motion, by which the operator can with facility move a body laterally after it has been raised vertically; as, in cases of engines or carriages being thrown off the line of rails, by applying the Universal Screw Jack, they can be replaced in a very short space of time compared with that required when the ordinary jacks are used.

The object of the inventor is to carry one with every train, so that in case of an accident occurring on any part of the line where there is great difficulty in obtaining assistance, the engineer and his assistant will be sufficient to set to rights any accident of ordinary description in a very short time with the assistance of the Universal Screw Jack.

They may be seen in use upon most of the railways diverging from the metropolis.—*Mechanics' Magazine.*

PROPOSED FLOATING BREAKWATER IN MOUNT'S BAY.

In our last number we gave a slight sketch of the proposed Breakwater in Mount's Bay, but as the expense of carrying into execution such a work is beyond the present means of its advocates, and no assistance likely to be obtained from Government, they have been considering the manner in which they can attain their object at a vastly diminished cost, viz., by means of a floating construction, or constructions, of timber, moored in the bay, and behind which, ships might ride at anchor in safety. An enterprising individual, Captain Tayler, of H.M.S. San Josef, has brought forward a plan for accomplishing such an object, by a series of moored floating frames of timber immersed to a depth of nine feet, and which he confidently asserts will destroy the violent action of the sea, and produce still water behind it, even during the severest gales. The plan of using rafts, or other floating constructions for breakwaters, is not new, and indeed has been practised by sailors from time immemorial;—when a vessel is unable to bear the buffeting of a gale, or a boat, or other small craft, is in danger of swamping by the violence of the sea, it is a common plan to lash as many spars together as they have, and cast them overboard, to which they make fast the bow of the vessel with a bridle, and providing there is plenty of drifting room, a vessel so circumstanced may ride in safety; for the waves first breaking over the raft are dismembered, and loose their power before reaching the vessel. That floating breakwaters will at no very distant period be adopted, where, either from want of large funds, or the hazardous nature of permanent works, they may be applicable, we have not the least doubt; and as the cost is so very trifling, and in the event of non-success, the loss which will be incurred—the timber being as valuable as in the first instance—so very small, that we may confidently look forward to the establishment of harbours in situations and localities where a permanent or fixed work would never be thought of.

The force acting on a frame, or section of breakwater, according to Captain Tayler, is as follows: each section being 60 feet long, 27 feet deep, and 25 feet wide, with the part below the line of floatation 9 feet, and consequently the number of superficial feet exposed to the action of the sea, 540. A lateral pressure of 144 lbs. on every foot is allowed for the force of the sea; but as a great deal of water will be forced through the Breakwater, 47 lbs. are deducted from the 144 lbs., leaving the actual force 97 lbs. on the square foot; then, 540 feet multiplied by 97 lbs. gives 52,380 lbs. of water, equalling the heaviest striking force of the sea. Taking the power of the wind at 18 lbs. to a superficial foot;—540 feet multiplied by 18 lbs. gives 9,720 lbs. for the force of the wind; allowing 5,000 lbs. for the power of the tide; then 52,380, + 9,720, + 5,000, are 67,100 lbs. for the whole of the acting force.

The portion immerged is 18 feet, by 25 feet wide, so that the sea has to push the floating body before it, which offers nearly thrice the resistance to the momentum of its velocity upon the 9 feet below the line of floatation.

The sea has also to raise the mooring chains on which there never can be a strain more than equal to their strength, and consequently they cannot be broken.—Although an allowance is made for the wind, it cannot act when a sea is breaking over the Breakwater.

The following is a comparison of the force of the wind and sea upon lighthouse vessels, with the same on the Breakwater.—These vessels are in the Gull Stream, off the Goodwin Sands.—Portsmouth,—Dublin,—and on a shoal in the North Sea.

A vessel of 25 feet beam, and 12 feet high, exposes a bow of 300 superficial feet, and the same number of feet being allowed for the hull, makes altogether 600 feet. 600 feet multiplied by 36 lbs. allowed for the pressure of the wind upon every foot, gives 21,600 lbs. power of wind acting upon the vessel. Admitting 144 lbs. of water (the amount acting on the Breakwater), to act upon the vessel's bows of 300 feet; then multiplying 144 lbs. by 300 feet, you have 43,200 lbs., and adding 21,600 lbs., pressure of the wind, and half that power, or 10,300 lbs. for the tide, the whole force is equal to 75,600 lbs.

In this calculation not one-fourth of the wind's power upon the vessel in a heavy gale is allowed, and it should be remembered that the breaking of the sea does not relieve a vessel from the action of the wind. Thus it is shown that such lighthouse vessels do not break from their moorings. The construction of the floating Breakwater relieves it moreover of much of the power of the sea.

[There appears to be some ambiguity in the reasoning of this paper, and an inaccuracy in the calculation of the wind's force on a floating lighthouse, which is taken at 36 lbs. on the square foot; whereas, on the floating breakwater, it is taken only at 18 lbs. In an extremely violent hurricane the wind acts with a power nearly equal to 50 lbs. on the square foot, which is the proper force to be provided against in every instance.—Con.]

TIDE OBSERVATIONS.

Some very remarkable indications of the violence of the late gales in the Atlantic are afforded by the curves drawn on the cylinder of Mr. Bunt's Self-registering Tide Gauge, erected in front of the Hotwell House, Clifton. The motion communicated by a float in the river to the pencil of this machine has strangely distorted the curves, which represent the tides of the 24th to the 28th of January, from the regular parabolic form which they usually assume. The mid-day tide of the 28th seems to have been much more affected than any other contained in the Register, since its commencement in August, 1837. The summit of the curve is thrown very considerably towards the left, indicating that the time of high water had been greatly accelerated by the disturbing cause; the difference, from that given in the Tide-table, being no less than 1 hour 26 minutes. The following comparison of the predicted and observed times of a few of the preceding and following terms in the series would seem to show that such was, very nearly, the actual amount of the disturbance:—

1840.	Times of High Water, according to				Difference in Tide Table.
January.	Tide Gauge.		Tide Table.		
	H.	M.	H.	M.	
27, p.m.	0	8	0	7	1 minute earlier.
28, a.m.	0	47	0	34	13 minutes earlier.
,, p.m.	11	41	1	7	1 hour 26 min. later.
29, a.m.	1	29	1	47	18 minutes later.
" p.m.	2	32	2	30	2 minutes earlier.

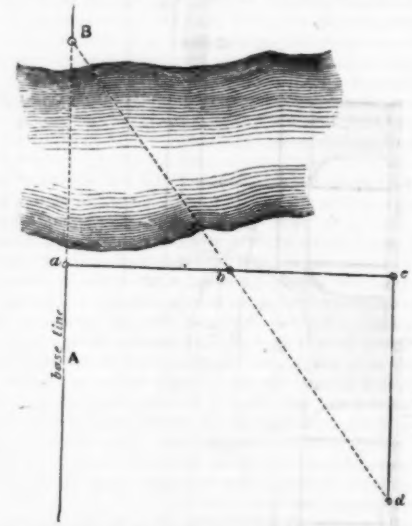
It is worthy of remark that, in the present instance, the time of high water only was affected, the mean height of the two tides of the 28th being exactly 20 ft. 8 in., as predicted in the Table. The effect of the hurricane which occurred on the morning of the 29th Oct., 1838, was just the reverse; the time of high water having been retarded about 10 or 12 minutes only, while the height was augmented by the enormous addition of eight feet.

DETERMINING INACCESSIBLE DISTANCES.

To the Editor.—Sir,—One of the modes which I practise for the above purpose, may be of service, I therefore communicate it for insertion.

I will presume that, in measuring along the base line *A B*, I arrive at any obstacle to direct admeasurement, in the shape of river, pit, pond, &c.

On either side of the base line, and at any angle which happens to be most convenient for the purpose, I set off two equal lengths, say 100 from *a* to *b*, and 100 from *b* to *c*, leaving a picket stave at *b*, and erecting one also at *c;* I then measure out from *c* parallel to the base line in the direction of *d*, to the length requisite for the imaginary line between the three points *B*, *b*, *d*, to constitute a right line, whence it is evident without, further demonstration, that the line from *c* to *d* is equal to the required distance *a B*.

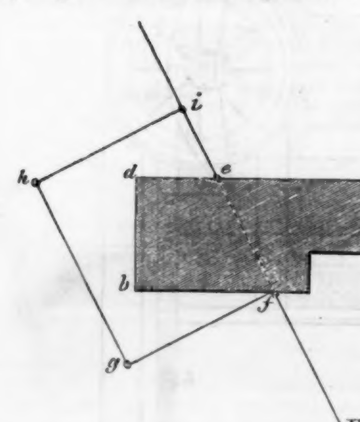


You will perceive that this method would serve for the supposed cases on this subject, proposed by each of your correspondents in Nos. II. and III. of your useful Journal.

I am, Sir, yours respectfully,
Thomas Greenwood.

Glossop, Derbyshire, 13th April, 1840.

Mr. Editor.—Sir,—At page 42 of the "Surveyor, Engineer, and Architect's Journal," I find a method given by A. D. C. for "Ascertaining the Diagonal distance through a Building;" but A. D. C.'s method being applicable only when the point *e*, on the other side of the building is given, and thinking it desirable that the point *e*, and the diagonal distance *f e*, should be determined by *one process*, I beg to submit the following method:—

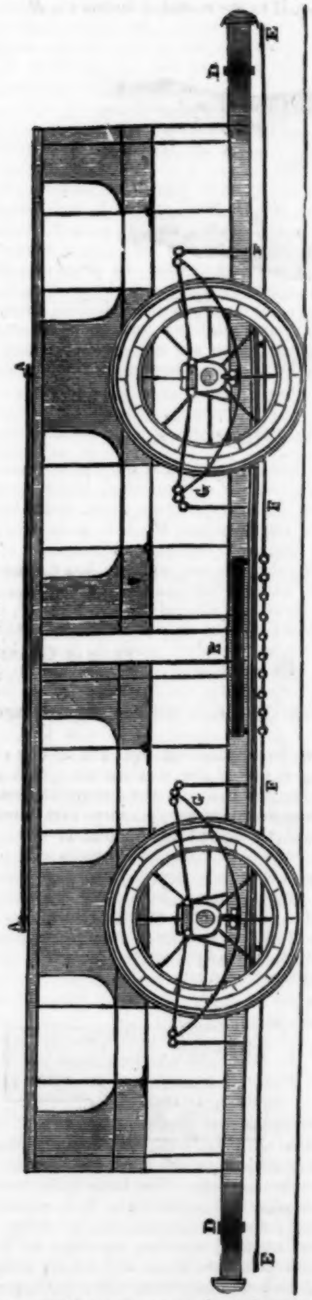


From the point *f*, erect a perpendicular *f g*, and from the point *g* erect a perpendicular *g h*, and also from the point *h*, a perpendicular *h i*, and make *h i* equal to *f g;* then from the point *i* erect another perpendicular to the building as at *e*, which will give the point *e* in a straight line with *F i;* and *g h* being equal to *f i*, by deducting the distance *i e* from *g h* will leave the diagonal distance *f e* as required.

I am, Sir, yours respectfully, A. J. H.

Birmingham, April 13th, 1840.

ADAMS' SAFETY MAIL CARRIAGE FOR RAILWAYS.



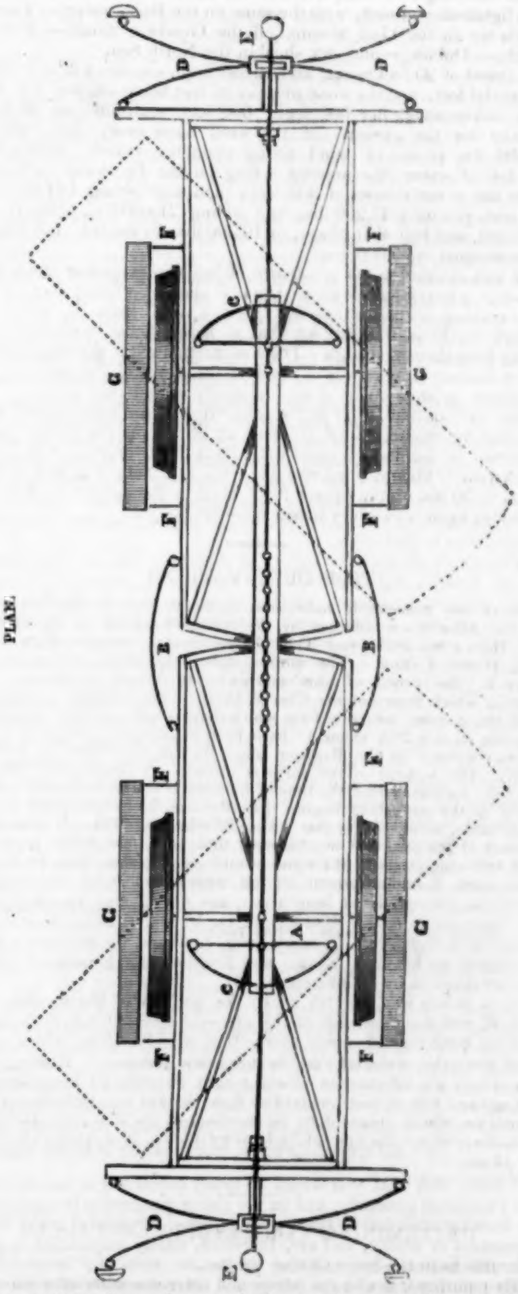
ELEVATION.

EXPLANATION OF LETTERS OF REFERENCE.

A, vertebral centres. B, ligament springs, which, being unfastened at one end of each, the carriage will move to the position shown by the dotted lines. C, traction bow-springs. D, shifting fulcrum buffer-springs, yielding two feet each if required; the exterior ends may be coupled to those of the adjoining carriages. E, the traction rods, with a central chain to permit them to shorten in buffing. F, suspension irons, firmly bolted to the body or frame-work. G, suspension springs.

The wheels are double felloed, and 4 feet 6 inches in diameter, with double movement, and oil lubrication, and turn in a circle of 11 feet 6 inches radius, without needing a turn-table. Total height from the rails, 6 feet 6 inches. Passengers' seats at the level of the suspension springs; carry 16 passengers (two abreast) without noise, vibration, or oscillation.

The same mode of construction may be applied to bodies of ordinary width and height, with the ordinary wheels.



PLAN.

In our last number we gave a short description, with engravings, of Adams' vertebrated common train carriage for railways—but the inventor having made some recent improvements—as exhibited in the above design—we are enabled, through the kindness of the editor of the "Railway Times," to lay an account of the improvements in question before our readers. The principal improvements, it will be perceived, consist in the vertebral arrangement, in suspending the body of the carriage from the bow-springs, and in the buffing and traction springs, and also in the application of a new description of wood wheel, particulars of which are given in another part of this number. We doubt not the above improvements will render the performance of these carriages more satisfactory, if possible, than those previously experimented on; when we may indeed say that the perfection of travelling will have been obtained,—at least in so far as ease and comfort in locomotion are concerned, which is by no means a secondary consideration.

TO THE EDITOR, &c.

SIR,—As your highly useful Journal is devoted to the advancement of the professions you advocate, allow me to draw your attention to what I consider to be an evil of the greatest magnitude, and one which may do more to lower the profession, and bring it into disrepute, than anything else that I am acquainted with. I allude to the proceedings of certain persons, styling themselves "Architects and Surveyors," or "Civil Engineers," who pretend to teach the profession in *a few lessons!* Such persons should be held up to scorn and contempt, for they have ruined the profession, while filling their own pockets. I will explain the manner in which they go to work. They first insert a specious advertisement in the newspapers, headed, "Offices for Surveying, Architecture, and Civil Engineering;" and go on to say that, *a few lessons* are all that is requisite to enable a person to practise on his own account! Some deluded individual is entrapped by this specious advertisement, for, unfortunately, wherever there are dupes, there are sure to be knaves to take advantage of them. Such persons (the dupes) find to their cost, that the business of an Architect, or Surveyor, or Civil Engineer, is not *quite so easily* acquired as they were at first induced to imagine by their instructor; instead of *a few lessons*, therefore, occupying a few weeks only, they are persuaded to go on with the farce for a few months, or, until the master-hand thinks they will bear plucking no longer. He then lets them go, assuring them that they are *quite competent* to undertake *any survey whatever*, whether for canal, railway, or turnpike-road, and, if asked, furnishes them with testimonials to that effect.

The newly-fledged Surveyor, or whatever else he may choose to call himself, delighted with his newly and (as he imagines) so easily acquired profession, hastens to put his skill to the test, and, for this purpose, perhaps takes an extensive parish to survey at a low rate; one, perhaps, that has to obtain the Commissioners' seal, and for which, he will, therefore, not be paid, until it is completed to their satisfaction. He commences his work with confidence, but after a short time becomes involved in a labyrinth of perplexity and error, from which he cannot extricate himself; he therefore hastens back to his Mentor to relate his misfortunes, and is persuaded by the latter to take a *few more lessons*, or, perhaps, is induced to employ him to survey the parish, for which he takes care to charge the "honorary" surveyor about five times as much as he is himself to receive for the survey when completed. If endowed with a sufficient stock of gullibility and cash, the latter accedes, and after expending, perhaps, a much larger sum than he would have done, if he had placed himself with a respectable surveyor in a regular manner, he at length acquires a sufficient knowledge of the business to enable him to get on by himself without making many more blunders. In many cases, however, the aspirant is disheartened by his first failure, and declines the honour of being further taken in by his *preceptor*.

Such is the way, Sir, in which the pockets of the unwary are picked, and the profession of the surveyor brought into disrepute; and the same remarks apply also to that of architecture, which some Professors also undertake to teach in a few lessons!! Really, Sir, the barefaced impudence of some men exceeds all bounds; and yet we see the advertisements of these highly reputable members of the profession almost daily in the newspapers,—a sure sign that it answers their purpose, which is to fill their pockets at the expense of others.

I think, Sir, that you would be really conferring a benefit upon the Profession generally, and on the rising generation in particular, by drawing attention to those persons, who, in general are of little reputation or ability, and are, therefore, totally unqualified to give instructions in the business they profess.

By pointing out also the fallacy and utter absurdity of a person's endeavouring to acquire, *in a few lessons*, a profession, for which a man's *whole life* is barely sufficient to enable him to acquire all the minutiæ of his art, and in which there is always *something new* to be learned; you may be the means of preventing the inexperienced from falling into such an error, and into the clutches of advertising *Professors*.

The profession is already overstocked with persons regularly educated, and perfectly competent to practise; and it is too bad that they should be continually brought into collision with, and made to suffer for, the ignorance and blunders of others, calling themselves "Architects and Surveyors," or "Civil Engineers," on the strength of a few lessons received from parties nearly as ignorant as themselves, and who are less able perhaps to practise the profession they pretend to teach than I am qualified to fulfil the duties of Lord High Chancellor.

I have the honour to be, Sir,

ONE WHO HAS SUFFERED.

London, April 21*st*, 1840.

[We know nothing of any such parties as those to which our Correspondent alludes; but, if there are any such, they deserve all that he has written, and more; and, if no such exist, his observations can give no offence to any one. As a cure, this is a little caustic; but, as a warning against the practising of imposition under cover of the name of a respectable profession, no language can be too strong. We again repeat that we know nothing of the existence of any such parties; for, though some professional men that we could name are not very profound in their ideas, we are acquainted with none who are not honourable in their intentions.—CON.]

TO THE EDITOR, &c.

SIR,—I observe, with some regret, that those who treat of architectural subjects, very generally confine their observations to the mere building, and say little or nothing about the adaptation of the style of building to the situation which it is to occupy, or to the bringing both of these into harmonious congruity by the aid of appropriate vegetable decorations, such as forest trees, shrubs, and flowers. Without having reference to these in the planning of a mansion or other structure, not only in the country, but in the environs and more open places of cities and towns, the very finest composition of the architect is often made to stand in a place wholly unsuited to it. I wish, therefore, you would impress upon your architectural correspondents the necessity of so doing, and thereby you would oblige me, and confer a great favour on the public.

A. Z.

[NOTE.—We have so far anticipated the wish of our correspondent, as to have engaged one of the very foremost landscape gardeners in England, who has laid out the grounds which connect some of the finest mansions in the country with the adjacent grounds, so as to make them part and parcel of those grounds; and who has also laid out public pleasure grounds with great taste and judgment. He has kindly promised to favour us with an occasional article on the subject; and, from what we know of his talents, and have seen of his designs, and their execution, we feel quite sure that his co-operation will be a real and substantial improvement, and, as such, duly appreciated by every admirer of good taste and harmonious congruity.—CON.]

REVIEW.

THE "LITERARY WORLD," CONDUCTED BY JOHN TIMBS. BERGER, LONDON.

THIS is one of the few books that perform a great deal more than the title promises. It is not merely the literary world, but a selection of a great number of subjects in the Fine Arts, Natural History, Science, and many other subjects. We have little hesitation in saying that, in the selection of its materials, it is superior to any other of the same class; and the illustrations, of which four will be seen in our present number, are very excellent in themselves, and quite of a different character from any which have hitherto appeared in a work of such a cheap rate. The letter-press is also very tasteful, and the whole getting up of the book excellent. It owes its chief merit, however, to the extensive knowledge and great tact of the editor; and we are aware of none except Mr. Timbs who could give so much variety to a work of the kind, and make it equally valuable in all its varieties. Indeed, we look upon it as the best book, over which to while away a leisure hour, that has appeared in the present age, fertile as that age is in miscellaneous works. There are few subjects in nature, in art, or in science,

which are not treated of, to some extent or other; and in them all, the popular gems are selected with very commendable skill.

It is the custom with many writers who pride themselves on their originality to consider a work of selection as one of a very inferior character. We differ entirely from such opinions, being well convinced that a book, which is only to be taken up in the snatches of time which can be spared from other avocations, ought to be an essence of many, and not the long-drawn speculation of any single author. The latter are books for leisure, and best suited for professional students, or those who are of studious habits, whereas a work like the "Literary World" is precisely of that miscellaneous nature which general readers—that is, readers who use books for amusement, and for picking general facts and passages of information—stand most in need of. This selection is remarkably chaste and judicious; there is nothing offensive, either on the score of morality or philosophy; and therefore it is a book which may with perfect confidence be put into the hands of persons of all ages, as one from which they cannot fail to derive much good, without the slightest admixture of evil. We have already alluded to the superior execution of the wood-cuts, and we may be allowed to add that the subjects are very varied, and selected with great judgment. The "Literary World" has already received great patronage; and it merits and cannot fail in obtaining more. With these remarks, we must take our leave of it in the meantime, but we may have occasion to revert to it upon some future occasion.

[We had intended to notice some other publications in the present number, but are prevented from want of room. Among these there is one on a subject of great interest, namely, the supply of pure water for the metropolis; but as the subject is one which involves many points, we must delay the consideration of it.]

IMPROVED METHOD OF MAKING BRICKS.

"A SIMPLE method of making bricks is made use of on the Great Western Railway on Mr. James Bedborough's contract at or near Marston. This mode, which is the invention of W. B. Prichard, Esq., Civil Engineer of this Railway, and late of the Chester and Crewe Railway, &c., is as follows:—The clay, only watered, is thrown into a common pugg mill (or mortar mill); there it is ground in a similar manner to mortar; the bottom of the mill is divided into four quarters, into which are grooves cut, and under which are placed four moulds of the same kind as those in common use by hand-moulders. Two boys are at the quarters taking the moulds out and placing others in; and by a peculiar knife in the bottom of the mill, which presses the clay into the mould, eight bricks are made every time the horse goes round, which is twice a minute; and at that rate the horse can travel twenty miles in twelve hours, thus making 960 an hour, or 11,520 per day. The bricks made by this machine are much heavier and sounder, and the clay much better tempered, than by any other mode of manufacturing that I have ever witnessed; and the saving is 2*s.* 6*d.* per thousand, besides other advantages, &c. Mr. Prichard informs me that he intends to present a model in a few days to one of the London Galleries. The whole cost of the machinery is about 10*l.*"—*R. Times.*

THE DESIGNS FOR THE ROYAL BOTANIC GARDENS.

THE Royal Botanic Society has recently been exhibiting, at its rooms, the designs for their Gardens, submitted by various candidates, for the fifty-guinea premium promised to the best. The designs are twenty-one in number, and of every possible variety. Some of the artists have principally attended to such a mathematical symmetry of arrangement as might befit an Italian pleasaunce, but not an English climate: some have mainly regarded those picturesque and park-like effects of tree and lawn, and ornamental water which would be incompatible with the purposes of floriculture: some, whose architectural ideas flow in too liberal a measure, have stocked the limited circle with kiosques, and *casini*, and huge conservatories, one half of which, if built, would make the scientific Society's domain yet more like Mrs. Rafferty's Tusculum, in its crowd of heterogeneous objects, than the King of Prussia's Pfauen Insel, for like reason, complained of by a correspondent. (*Athen.* No. 626). Others, again, have studied scientific, and even hemispherical classification, until the execution of their plans would leave the ground as barren of beauty to the casual visitor as a cabbage-garden. Nothing, in short, is so difficult, as the union of the picturesque with the practical. The principal objects of interest, while sufficiently prominent, should reveal themselves by degrees; hence the fault of a great central building, with walks radiating from it to the four cardinal outlets. There is a nice distinction, too, between that shrubbery character which befits a wide domain, and that high finish demanded for so limited a space, in which every tree and turn of a walk should have its effect. On all these grounds—making every allowance for the difference between landscape-gardening on paper, and when done in grass and gravel—the plan No. 9, by Mr. Burges Watson, appears to us the most eligible,—as affording variety, surprise for the eye, accommodation for the promenador, and a fair admixture of the irregularly picturesque with the formally scientific.—*Athenæum.*

PNEUMATIC RAILWAY EXPERIMENT ON THE BIRMINGHAM, BRISTOL, AND THAMES JUNCTION RAILWAY.

THE engine-house is built, and the communicating tube between it and the railway, by which the exhaustion of the main tube is to be effected, is nearly laid. The permanent way and rails are also almost completed, and fit for the laying down of the tubes for a considerable distance out of the 1¼ miles on which the experiment is to be made. We perceive also that a great many of these tubes are already arrived and on the ground. They are nine inches diameter, and are lined inside, to about the tenth of an inch thick, with a hard unctuous substance, much resembling, in its disagreeable and suffocating smell, hard tallow. The slit or aperture of the tubes through which the arm communicates with the running piston and the carriage is about 1⅛ inch. We understand, if the experiment be successful, the Company are to have the use of the patent gratis, for devoting the road to the trial, and are to purchase the whole apparatus and preparations at cost price; and if it does not succeed, all is to be cleared off within a given time. Supposing the experiment effects all that its advocates expect, we cannot see the use of so small an apparatus in such a place. If we remember right, the inclination of the road, about that part, is 120 feet a mile; therefore, the traction is more than three times that on a level, or above 24 lbs. to the ton. But a circular tube 9 inches diameter, fully exhausted, and exclusive of all friction, would only draw about 954 lbs., or, at 24 lbs. per ton. under 40 tons. The probability, however, is, that it will never in that length be half exhausted; so that the absolute load it would take would be under 20 tons, carriages, load and all, assuming a perfect absence of all friction in the machinery. We shall, however, be much surprised, if the useful effect is anything like this. Our opinion is, that the patentees have made the apparatus much too small for any useful purpose upon such a road, and also for the purpose of showing off the invention well, assuming it to be all that can be expected of it. A few days ago the works were suspended, in consequence of a dispute between the Messrs. Samuda and the contractors, about the point of delivery of the tubes—that is, whether it should be a few yards on the north, or a few on the south of the crossing of the Great Western line. Where so much is involved as here, this dispute is equally as ridiculous as that of the Lilliputians and their neighbours, about which end eggs ought to be broken.—*Railway Magazine.*

MESSRS. FAWCETT AND CO.'S ESTABLISHMENT, LIVERPOOL.

THE object of this establishment is principally the construction of marine and other steam engines, mill machinery, pieces of ordnance, and other heavy articles of the foundry and the forge, which here pass from their rudest state through the various requisite processes, until they are turned out bright and perfect from the hands of the finishers. The magnitude of the works may be estimated from the facts, that the premises stand upon an area of many hundred yards; that that space, nearly covered by lofty buildings, is found incommodiously small; and that the number of workmen employed in the various departments considerably exceeds seven hundred. We shall notice the several departments under their respective heads, and conclude with some particulars of the fine marine engines now in a state of forwardness.

FOUNDING AND BORING OF CANNON.

On entering the yard the attention of the visitor is arrested by the great number of cannon of various sizes and calibres, from swivels and half-pounders to thirty-two pounders, ranged on the ground, or peeping, in carriages, with portentous aspect, from doorways, entrances and corners. The large guns are of various fashions, some being cast from the plain models used in the French navy, others from those of the Dutch, and others of the more decorative form approved of in England. In casting these guns (all solid), what is called "a head" is cast along with them, at the muzzle end, having the appearance of a plug or long tompion. This, which is cut off before the boring is commenced, is for the purpose of resting the piece at that end, while it is exteriorly cleaned off and polished. At the breech, too, an additional square piece of the metal is cast on, by which the gun is turned by machinery while it is being bored, the borer being stationary in the operation. When outwardly cleaned and finished (with the exception of drilling the touch-hole and fixing the lock), the gun is placed horizontally, and secured so as to turn without vibratory motion. The machinery is then applied, and the gun turns rather slowly, advancing with an even pressure upon the large steel boring instrument, and continually discharging the metal which it cuts out. The gun has to be bored two or three times, according to its calibre, and when the operation is completed the bore is as bright and true as that of a fowling piece. The touch-hole is afterwards drilled out with great nicety, as are the holes, in raised portions of the breech, for the fixing of the flint lock, which has now in gunnery almost superseded the use of the match. Amongst the pieces of ordnance now in preparation, or finished, at the works are:

26 thirty-two pounders for a French house.
20 twenty-four pounders, another French order.
4 twelve-pounders for the same.

THE FOUNDRY.

This part of the works differs from most other foundries, only in the immense weight of the castings, which, from the size of the building, and the number of blast furnaces, cranes, &c., may be turned out. Single pieces, of twenty tons each, might be accomplished, if required. The operation is interesting, but it is too generally known to require detail. The article to be cast is moulded (in sand) from wood, and enclosed within iron frame-work, a hole being left for the entrance of the metal. The metal is thrown, in broken pieces, mixed with coals, into a large cylindrical furnace, which being blasted by machinery with great force, makes a roaring noise, and soon brings the whole to a white heat. The metal, as it melts, sinks to the bottom. When all is ready, a perforation is made with the point of an iron rod, through a sort of bung-hole at the bottom, which is stopped up by fire clay. The boiling metal immediately rushes out in liquid white fire, and is received in pots with three long horizontal iron handles, two at one side, like those of a hand-barrow, and one at the other. By these it is carried by three or four men, according to its weight; and if the castings be comparatively small, the metal is poured at once from this into the moulds, the pot being turned by the men holding the two handles. If, however, the casting be large, the smaller pots full of liquid metal are discharged into a cauldron of sufficient size, and this, from its great weight, is hoisted by a crane and placed over the casting, where it is discharged of its contents. The air, forced out of the sand by the metal frequently makes a loud explosion, and when the intense heat of the hissing iron perforates the entire portions of the same, blue and sulphurous looking flame issues from the cracks in the mould. When the metal is sufficiently cooled, the frame-work is removed, and the castings taken out.

THE WORKING-ENGINE ON THE WORKS.

On the east of the yard, on each side of which are extensive buildings, is the larger engine, of thirty-six horse power, which works the greater part of the machinery used in the different rooms, in the several operations of turning, planing, drilling, the obdurate but conquerable metal being completely overcome by the power of the works. This engine is of the old-fashioned principle, with an immense wooden beam, secured with iron, and a large fly-wheel. It is, however, most effective, communicating, by cog-wheels and shafts with the several rooms in which the power is applied to the lathes, &c., by drums and shafts. There are also other engines, but of considerably less power.

THE SMITHY.

This is one of the most extensive portions of the establishment. It comprises two large buildings thrown into one; and a great number of workmen are constantly employed. There is an avenue of anvils, and the constant hammering, the blowing of their fires, together with the dusky visages of the athletic workmen, remind one of the description of the abode of the Cyclops. Here, however, "bolts" are "forged," of which neither Jove nor his armourer Vulcan could have conceived any notion. All the iron work for the steam engines is made here, with the exception of the very heavy paddle-shafts, which are brought in the rough from the Mersey forge.

THE PLANING MACHINE ROOM.

In this room are valuable and elaborately contrived machines for the planing or levelling of large plates, or other pieces of iron or brass, so as to give them a smooth, true, and polished surface. The article or piece to be planed is securely fixed by screw-bolts, &c., to an horizontal iron table, perforated with holes for the insertion of the bolts from beneath it in any required point, to suit the size or form of the article. This table, when put in motion, travels backwards and forwards with its load on two iron rails, or parallel slides. Over the centre is perpendicularly fixed what is called the "planing tool," an instrument made of steel, somewhat in the form of a hook, with the point so inclined as to present itself towards the surface of the metal to be planed, as it approaches it on the table, so as, when all is adjusted, to plough or plane it in narrow streaks or shavings as it passes under it. The extremity of the tool is about half an inch to three quarters in breadth, and being of a round form at the under side, and ground or bevelled on the upper, presents a sort of point. If a plate of iron is to be planed, the operation commences on the outer edge, and each movement of the table backwards and forwards places it in such a position under the tool that another small parallel cut is made throughout its whole length. By a peculiarly beautiful contrivance, the cutting instrument, the moment the plate passes from under it, "jumps" up a little in the box or case to which it is attached, and instantly "turns about" in the opposite direction, and commences cutting away, so that both backwards and forwards the operation goes on without loss of time. The workmen very quaintly and appropriately call this new planing tool "Jim Crow." A workman attends to each of the machines, and when the piece to be cut is fixed with great exactness on the moving table, by a spirit level, he has nothing to do but to watch that it remain so, and that the machinery work evenly and correctly. Where a very smooth surface is required, the operation of planing is repeated, and two plates thus finished will be so truly level that they will adhere together. It should be added, that so perfect are these machines, that in addition to planing horizontally, they may be so adjusted as to plane perpendicularly, or at any given angle.

THE TURNING ROOM.

In several of the rooms both malleable and cast iron of all possible dimensions are turned, with astonishing facility and correctness, on what are called slide lathes. In one of these we saw one of the paddle shafts of the "President" under operation. Each of these weighed, when they came from the forge, about ten tons, and they will be but slightly reduced in weight by the turning. While the shaft or rod is revolved, the cutting instrument, fixed to a slide, on which it is slowly and evenly carried along, performs its operations with wonderful precision, frequently cutting a large and continuous shaving of thirty or forty feet in length (as may be), apparently as if it were lead, and which, curling up, forms a curious and perfect worm or screw. From the great pressure of the tool, one of the edges of this screw is frequently split into regular teeth, like those of a fine comb, but shorter. The tool, when it has gone from end to end of a shaft or rod, is, by a simple adjustment, made to travel back again, and the operation is continued till the whole is of the required diameter, and perfectly bright and polished. Another interesting operation in this department is the turning and polishing of circular pieces of machinery, whether dished or flat. The tops or lids of the cylinders of large engines are the principal, and some idea may be formed of the advancement of this art, by an inspection of the cylinder tops of the "President," which are as bright as mirrors, and are 80 inches in diameter! Water constantly dropping on the cutting tool from a small pipe is all the "oil" used either in planing or turning.

THE FITTING-UP SHOPS.

There are several rooms in which the "fitters-up" are employed. These finish the smaller brass and iron work of the engines, and have turning lathes and all manner of hand tools. In the building of an engine, they hold the same relation to the foundry and the forge, that the clock and watchmaker (properly "finisher") does to the establishment that supplies him with his wheels and other works in the rough.

THE MODEL OR PATTERN MAKERS' ROOMS.

These rooms are extensive, and many first-rate workmen are employed, the greatest exactness being required, otherwise the castings would be unavailable. The timber used is almost wholly well-seasoned deal. Many of the patterns are complicated and beautiful, a great deal of taste being displayed in the mouldings and other decorations, where

such can be appropriately introduced. The models are all finished and polished in the best possible manner.

THE MODEL ROOMS.

These are a lofty part of one of the buildings, and are well worthy of a visit. In one of them we were fairly lost amidst many hundreds of bevelled, cog, and other mill wheels of all possible sizes, and piled up to the very roof. Many of these are for the purpose of supplying foreign orders. Here, too, are a variety of engine-bed plates, paddle-wheel centres, patterns for water and other wheels, &c., &c., all made with mathematical accuracy.

In another room were an immense number of models of great guns, as adopted by different nations. The models of beams for marine engines, of all sizes, were here piled; also of Ionic fluted pillars for their frames. The models from which the beams, &c., of the "Royal William," and many others, were cast, are here deposited, as are those of the larger engines in the yard below. The collection of patterns of all descriptions is indeed great and excellent, and must have cost an immense sum of money.

The following engines are now in hand at the works, and the three largest nearly completed:

1	pair of 540-horse power, for the "President."			
1	ditto	420	ditto	the "United States."
1	ditto	450	ditto	a French man-of-war steam-frigate.
1	ditto	300	ditto	H. M. S. "Medina."
1	ditto	50	ditto	the "Calcutta Steam-tug.*
1	ditto	45	ditto	a Government tender.†
1	single engine of 60-horse power for Australia.			
1	ditto	50	ditto,	for a French house.

THE "PRESIDENT'S" ENGINES.

These are the most remarkable for their size, and are really a stupendous piece of workmanship. They are already fixed up, and strike the visiter with astonishment. The castings and all the workmanship are of the first description, and the architectural design of the framework, or pillars, is highly ornamental, without any sacrifice to the requisite strength. As probably the most suitable to attain this desideratum, the Gothic style has been adopted. The massy clustered pillars are surmounted by the pointed and moulded arch to correspond. The beams are beautiful castings, as are the cylinders, and both of immense size and weight. The polished iron and brass work is superb, and the whole furnishes a gratifying proof of at once the enterprise and the ingenuity of England.

The following are some interesting statistics of this stupendous piece of machinery:

Diameter of cylinder	80 inches.
Stroke of engine	7 feet 6 inches.
Weight of cylinders	11 tons.
Valve-cases, from	6 to $6\frac{1}{2}$ tons.
Beams (four in number), upwards of	5 tons each.
Condensers, about	10 tons.
Gothic pillars, four pairs, each	11 tons 7 cwt.
Diagonal stays, four in number, each	4 tons.
Main, or paddle shaft	9 tons.
Two eduction pipes, each	18 cwt.
Boilers, each	30 tons.
Bed-plates (two), each in one casting	15 tons.

The whole engines and boilers, with the water, will weigh about 510 tons.

The hoisting-tackle used in setting up these engines is well worthy of notice. On the principals, or lower beams of the roof, which are of extraordinary strength, railways are fixed, upon which traverse scaffolds, railed round, and each carrying a powerful winch. On these scaffolds are also railways, at right angles with those on the beams, so that, by moving the scaffolds and the winches, any spot in the building may be attained directly perpendicular to the article to be hoisted, which, by other movements, can be lowered to any given site.

THE ENGINES FOR THE "UNITED STATES."

These are precisely similar in construction to those of the "President," differing only in being a little smaller. No detailed notice of them is therefore required. The cylinders are $73\frac{1}{2}$ inches in diameter, and the power is the same as that of the "Great Western"—namely, 420. They are erected in the same shed, or building, containing those of the "President," and have been equally admired.

* Now building in India.

† To run, it is said, between Dover and Calais.

THE "MEDINA'S" ENGINES.

These are of 300-horse power, and, though different in the style of the casting, are also got up in the best manner.

The whole three pairs of engines will be ready simultaneously for shipment; but, unluckily, the want of proper shears to hoist in the machinery and boilers, (there being but one pair at the Canning Dock, and a pair at the Trafalgar), one or other of the vessels will have to wait her turn.

The pair of 45-horse power engines, for the Admiralty, are also in a forward state, as are most of the others before enumerated.

Such is a sketch of the works at Messrs. Fawcett and Co.'s establishment. The whole is a world of mechanism within itself; and though it sends forth huge and deadly weapons of war, it also produces maritime machinery calculated to extend civilization, and to promote the amicable commercial intercourse, and mutual wealth and happiness, of nations scarcely known to each other but by name.

PROGRESS OF THE WORKS AT THE NEW HOUSES OF PARLIAMENT.

FROM A CORRESPONDENT.

It appears that the commencement of the undertaking was attended with considerable difficulties. The formation of a dam of sufficient strength to resist the pressure of the high tides, and keep dry a large space in the bed of the river, was a work requiring no ordinary skill and ingenuity for its accomplishment. After this had been successfully effected, preparations were made for laying the foundation of the river front. As the wings, and the terrace which occupies the space between them, rise directly from the water, this also was a work of no ordinary difficulty. The upper strata of the river's bed upon which it must necessarily rest, had to be entirely removed, and, to render the foundation as secure as possible, a bed of concrete, from five to fifteen feet in thickness, was laid down along the entire line, upwards of 1,200 feet in length. The brick work was then commenced and carried forward with great rapidity, and the whole of the foundations of the river front are now, and have been for some time, brought up to one level, namely, two feet three inches above Trinity high water mark. This part of the design includes the northern wing adjoining Westminster Bridge, intended for the official residence of the Speaker of the House of Commons—the terrace front, which comprises the libraries and committee rooms of both houses—and the southern wing, in which are the apartments of black rod, the librarian, the housekeeper, &c.; also a portion of the north flank, beginning at the clock tower in Palace-yard, containing the house of the sergeant-at-arms; and another portion of the south flank, extending nearly to the grand tower rising above the royal entrance, which contains accommodation for the Lord Great Chamberlain on state occasions, and the great public staircase and waiting halls of communication, with the committee rooms and libraries in the centre, immediately adjoining the rear of the river front. Messrs. Grissel and Peto, the contractors, have undertaken to complete this part of the building in three years from its commencement. Much time has been spent in deciding upon the description of stone most suitable to be employed in the superstructure. The quality of much of that lately brought to London from Portland, and used in metropolitan structures of recent date, was strongly objected to, as being very inferior in quality. The gates at Hyde-park-corner, and other buildings of recent date, where symptoms of decomposition are already apparent, were adduced as instances of the truth of this assertion. The colour, also, which becomes on exposure to the atmosphere a chalky white, was thought to be particularly unsuitable to a building of a Gothic character. After a protracted examination of the principal veins of stone in different parts of the kingdom, a kind of magnesian limestone, approaching very nearly to what geologists call dolomite, was selected, and recommended for use in the New Houses of Parliament. The cause of the slow progress of late has arisen from a difficulty of procuring this material in sufficient abundance; several veins, upon a more minute examination, having been found wholly inadequate for that purpose; but this unexpected obstacle is now happily removed, and four sources of supply have been fixed upon. The first is at Bolsover, about a mile and a quarter from Mansfield belonging to Mr. Lindley; the next is at Anston, about six miles from Worksop, on the property of Mr. Sykes. This latter is to be used chiefly in the plinth, and those portions of the structure where great strength is required. The third is at Steetley, in the same neighbourhood, but in the adjoining county of Nottingham, belonging to the Duke of Newcastle, which will be used exclusively for the internal work and other parts of the edifice not exposed to the influence of the weather. The last is at Norfall, in Yorkshire, the property of the Duke of Leeds. The stone will be conveyed from the several quarries by the Chesterfield canal to Gainsborough, and thence by water to its destination in

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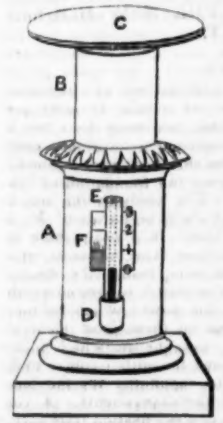
town. A large quantity has arrived, and a good deal of masonry is prepared to commence the superstructure. The propriety of laying a foundation stone, and of having a public ceremonial on the occasion, has been taken into consideration; but, inasmuch as no one but the Queen could with propriety perform the ceremony, and as a great expense would necessarily be incurred, without being productive of any proportionate benefit, it has been thought better to let the work go quietly forward, and dispense with the ceremonial altogether. Accordingly, it has been resolved to commence the superstructure without any further delay, and on Monday next the work will begin.

It is anticipated that, by the end of the present year, the portion of the building above described will be from fifteen to twenty feet above the surface of the ground.

SHARP'S HYDROSTATICO-PNEUMATIC LETTER BALANCE.



This neat little instrument is constructed exactly on the principle of a gasometer. A is a cylinder of brass or other metal, which may be ornamented according to the taste of the maker. It is so far filled with water; and the cylinder B, partially filled with atmospheric air, sinks so far into A by its own weight. To the top of B, there is appending a frame, C, the form of which is also a matter of indifference; and the weight which is to be determined by the instrument is placed upon this frame. The quantity of the weight is determined by a very simple means: a tube of copper or other metal, which cannot be shown in the external view of the instrument, is soldered into the vessel A, within which it rises above the level of the water, so that its aperture is within the air in the vessel B. This tube is bent upwards at the extremity which comes outside the vessel A, and a piece of glass tube is ground or otherwise adapted to the extremity so as to be water-tight. A coloured fluid is inserted in this tube, and of course occupies a portion of the bend. By loading the upper vessel B—or the frame C which it carries, the air in B is compressed, and the pressure causes the coloured fluid to ascend in the glass tube; and by trial the ascent for any weight, as an ounce or a half ounce, may be determined. When the rise of the coloured fluid answering to the different weights is once ascertained, it may be marked on a scale, only this scale must slide in order to adapt it accurately to the state of the instrument. In using it, the zero of the scale is made to coincide exactly with the surface of the fluid, when the upper vessel and the frame which it supports are free from load, and then the additional rise against the scale will show the exact weight of the letter or other substance placed upon the frame. Very slight inaccuracies of this balance may be occasioned by different states of tension or elasticity in the atmosphere; but these are so very minute that they can produce but little disadvantage in it as a letter balance; and as it may be made a pretty ornament, is very easy in the use, and not subject to much derangement, it is one of the most convenient letter balances that has been invented, numerous and varied as they are.

THE UNITED STATES STEAMER.

This vessel is admitted by all who have inspected her to be beautifully modelled. Her frame throughout is of the choicest British "heart of oak." Her timbers, from her kelson to her bilges, are laid close together, and interially caulked, so that her bottom, to that extent, would be water-tight, even if her planks were removed. Her garboard stroke (of 8 inch plank) is bolted together through and throughout her kelson. Her flooring timbers are all cogged, or dowelled together, and further secured by strong rods of iron driven through them, fore and aft. Her bottom planks are of American elm; and such is the joint thickness of these and the timbers, that they form a solid mass of 18 inches in thickness. Her sides are proportionately strong, and so bound together, that it would seem impossible that she could be at all shaken by any casualty at sea. Her bends are of African oak; her upper planks of English oak and fine red pine, which last is, between wind and water, equal in durability to any other timber. Her sides are strengthened by bands or strips of iron, of 5 inches in breadth and ¾ inch thick, counter-sunk diagonally into the timbers, and bolted through them, those forward inclining towards the stern, and those aft towards the bow. Over these are diagonal wooden riders of English oak, each 9 inches by 6 inches in thickness, also bolted through, so that both form counter-acting stays, or binders, giving the vessel extraordinary strength. Her clamps are all screw-bolted through the sides; the fore and aft beams of the boiler hatch are of iron, and interiorly she is fairly studded with the ends of the screw-bolts from her sides. The hold presents a magnificent specimen of the magnitude and perfection to which naval architecture has attained. The frame-work for the engines is an exceedingly massy piece of carpentry—composed of immense beams of African oak. The thickness of these, from the flooring, is no less than three feet.

The United States will be rigged with fore-topmast and top-gallant-mast. Under the taffrail are the arms of England on one side, and those of America on the other. The following are her dimensions:—

Length from stern to stern....	235 feet
" of keel....................	215 feet
Breadth across the centre..........	60 feet
Depth of hold....................	38 feet 6 inches
Height between decks	7 feet 6 inches
Length of each saloon, fore and aft..	70 feet
Breadth of " " " ..	42 feet
Burden, besides her coals	800 tons
Total admeasurement..............	1400 tons
Engines	420 horse-power.

We have been thus particular in order to give a slight idea of these truly "gems of the sea." In short, when we say that nothing that art can invent, or labour and perseverance accomplish, it will be understood that little is wanting in order to complete the perfection of these "offsprings of our own times;" upon the construction of which, as a nation, we may justly pride ourselves.

INSTITUTION OF CIVIL ENGINEERS.

Feb. 21,—The President in the chair,—The following communications were read:—

"On Steam Engines, principally with reference to their consumption of Steam and Fuel." By Josiah Parkes, M. Inst. C. E.

The above is the second and concluding communication on this subject; in the former, the generation of steam more particularly was considered; in the present, its application when generated. These are distinct questions, as it is the economy of steam which constitutes the dynamic perfection of a steam engine, whereas it is the economy of heat in supplying that steam which constitutes the perfection of the boiler as an evaporative vessel. These economic properties are totally independent of each other; they may co-exist in a maximum degree, or in very different degrees, and the degree of perfection which any particular class of engines, or which the particular engines of any class possess, is known from the weight of fuel burnt, of water evaporated, and the mechanical effect realized. As long as engines were constructed with but few varieties, or identical in their forms, the performance of one was a sufficient indication of the performance of all; but new forms of engines and new modes of practice being now introduced, a comparison of the performance on the several systems is a matter of deep practical and scientific interest. With the view of effecting this object, the author has collected all the authentic facts within his reach, and reduced them to common standards of comparison.

The effective power of steam engines may be ascertained either from the resistance overcome, or from the load upon the piston by means of the indicator; the former method being applicable to pumping, the latter to rotative engines. But the effective power of the steam in pumping engines, as thus ascertained, is far below the real effective power of the steam, and no exact comparison can be made by these means between the effective power of the steam in the two classes of engines. The useful effect is not synonymous with a true measure of effective power, since the duty is the true useful effect in a Cornish engine. The indicator when applied to the Cornish engines enables us to ascertain the absolute but not the effective power, so as to compare it with that of the rotative engine, since the friction of the engine and the load cannot be separately determined. The absolute power of the steam may also be ascertained from the relative knowledge of the elastic force of steam corresponding with the ratio which the volumes of water bear to each other. This theoretical estimate requires, however, several corrections; among which the steam condensed by contact with colder surfaces, the steam consumed in filling useless places, and that lost by priming, must be particularly noted.

The relative performance of pumping engines is well expressed by the term "duty," that is, the number of lbs. raised one foot by a given quantity of fuel; and of rotative engines by the term "horse power;" that is, the number of lbs. raised one foot in a minute, divided by 33,000 lbs. the standard measure of a horse. The performance of the rotative engine may also be estimated by duty, and of pumping engines by

horse power. The results of these computations for several engines are tabulated in this communication.

The sum of the latent and sensible heat being constant for steam of all elasticities, the expenditure of both power and heat is truly measured by the weight of water consumed as steam; this measure is free from all uncertainty, and independent of all theory; the weight of water as steam is equivalent to the production of a horse power in each engine, and the duty effected by one pound of steam, will denote the positive and relative efficiency of the steam and the heat. These indices of efficiency being referred to some standard, we learn, from the preceding data, the precise value of each engine in its use of steam and fuel; of its boiling apparatus, as a generator of steam; of the comparative efficiency of the steam and coal, or economy of power and fuel. The results which may thus be obtained are also exhibited in tables accompanying the communication.

The power resulting from the expenditure of equal weights of water, as steam, being known, the boiler may be connected with the engines, and the relative extent of heating surface employed to furnish their power shown. It will thus appear that equal measures of surface are quite inadequate to supply equal power, with equal economy, to different classes of engines. These results are tabulated in great detail, and it appears that the Cornish engineers now employ nearly eight times as much boiler surface for equal nominal power as that given by Watt's practice. But taking into account the fuel burnt per horse power per hour in the two cases—the Cornish engine consuming 2½ lbs. per horse power per hour, and Watt's engine 8¾—the true relation of the boilers is as 19 to 1. Many other relations of a similar striking character may be deduced from these tables.

The detailed results of the experiments by Smeaton in 1772, on his improved Newcomen engine at Long Benton—by Watt, in 1786, on his rotative condensing engine, at the Albion Mills, are recorded in these tables; and it appears that the economy of the latter, as regards steam and fuel, was double that of the former, and approached very nearly to perfection in the use of power obtainable on that principle. The next great advance in the economy of fuel and power is that made by the Cornish engineers, whose performance, both with pumping and rotative expansive engines, far exceed any attained with the common unexpansive condensing engines. The superiority of two of these engines in 1835, doing a duty of 80 millions, exceeds the engines of Watt and Newcomen by 2½ and 5 times in economy of power, and by 3½ and 7 times in economy of fuel.

The obtaining a standard measure of duty is of great importance; a heaped measure, as a bushel of coals, is highly objectionable, as the weight of such measure will vary from 84 to 112 lbs. In the Cornish reports, the bushel is fixed at 94 lbs. weight, as the standard of comparison, but some portion of a ton or one lb. would be a better standard. Other combustibles, however, as coke, peat, &c., may be used partially, or to the exclusion of coal, and under these circumstances, some other standard of comparison is necessary, and with this view the author suggests a pound of water in the form of steam as the best standard of duty. The work done by a given quantity of water as steam is a sure index of the quality of the steam engine; it is a measure unaffected by variable calorific agents, and so long as engines continue to be worked by steam, so long will the performance of different engines be accurately guaged by their respective expenditure of water as steam. The accuracy of this measure depends on the physical fact of the constancy of the latent and sensible heat in steam of all temperatures. The author has recorded twenty-eight experiments made on twenty-eight different days, on vapourization from the boiling point to 60 lbs. pressure above the atmosphere, which present a remarkable confirmation of the above law, and show that the relative efficiency of steam in engines is due to the manner of using it, and not to any change in its chemical constitution at different pressures. The manner of conducting these experiments, and the precautions taken to ensure accurate results, are detailed with great minuteness.

The author next proceeds to treat of the locomotive engine, and to discuss, compare and tabulate the facts relating to this engine in the same manner as he has done those of the stationary class. The qualities of the boiler of the locomotive as an evaporative vessel had been discussed in the first communication. The locomotive differs from the fixed non-condensing engine only in the use of the blast, and the same method of measuring the effects of the steam are applicable to both. Experimenters on the locomotive have generally attempted to determine the amount of resistance opposed to its progress, in preference to ascertaining the power expended in overcoming the resistance. The exact solution of either of these questions would furnish all that is wanted; but the ascertaining the total resistance by an analysis of its several constituents is attended with great difficulties, as the forces to which they are to be referred are so exceedingly numerous and variable, that the assigning the exact value to each at any one velocity has hitherto eluded the talents of those who have pursued this method. M. de Pambour was the first analyst whose labours will require attention. The results given by this author in his practical treatise on locomotive engines on railways were compared by Mr. Parkes with the results which he had obtained when experimenting on an engine of precisely a similar character, and discrepancies presented themselves which appeared totally irreconcilable. These and other circumstances led the author to consider, whether the resistance to traction would properly be deduced from the laws of gravitation, or whether any certain results would be derived as to the amount of resistance on a level from observations on engines and trains moving down inclined planes. The great object seemed to be to discover some criterion of the mechanical effect produced by a locomotive at all velocities, which would apply as practically and as distinctly to a locomotive as duty to a pumping engine, or horse power to a rotatory engine. If this were possible, it seems of far less importance to distinguish the precise value of each particular unit of resistance, than to determine the relative sum of resistant and the relative expenditure of power at all velocities and under all circumstances. Now the term duty may be applied in the strictest sense of the term to the work done by a locomotive engine; for whether the engine drag a load whose resistance is 8 lbs. per ton, or whether a weight of 8 lbs. for each ton of matter moved descending over a pulley and attached to the load, be considered as the moving force, the result is the same. If, then, the tractive force, or resistance per ton of matter in motion, which is the real load on the engine, be ascertained, the whole effect is found by multiplying this sum by the space passed over in feet; and the consumption of water as steam and of coke being known, we have all the elements requisite for determining the duty performed by the steam or coke. The pressure against the pistons may be deduced from the sum of the resistances first calculated on the assumed resistance overcome at the velocity of the engine in each experiment; and the pressure on the pistons may also be deduced from the ratio of the volumes of the steam and water consumed. The results which may be obtained on these principles are tabulated, for the experiments of M. de Pambour, Robert Stephenson, and Dr. Lardner. In another table the author has recorded the reduction of each of these experiments to terms of horses' power, and has exhibited under that denomination the absolute power resulting from the steam used—that required to overcome the assigned resistance—their differences—and the power which balances the gross and useful duty. The construction of these most elaborate tables is described in great detail, and the consequences which follow from the tests thus obtained are fully stated, and the author comes to the conclusion, that results inconsistent with the capabilities of the locomotive are perceptible in almost every one of the experiments. A condensing engine placed on wheels, with water of condensation transported for its supply, and made to drag a train along a railway, would require the same expenditure of water as steam to produce a given effect, as if fixed; a non-condensing engine also is one and the same machine, whether fixed or locomotive, excepting that the latter must consume more power than the former, to do equal work, at like pressures, by the amount of the additional resistance arising from the contraction of its eduction pipes, in order to produce a fierce blast of steam through the chimney. From these and other causes the fixed non-condensing engine must be the more economical of the two; but if the results derived from M. de Pambour's data be correct, we must acknowledge the fixed non-condensing engine, with its simple atmospheric resistance, to be far inferior in economy of steam to the locomotive, with its plus atmospheric resistance. The experiments by Dr. Lardner were made for the purpose of determining the resistance opposed to progressive motion on railways. They consisted in dismissing trains at various speeds from the summit of inclined planes, and in observing their velocity when it became uniform, the resistance at such velocity being equal to the accelerating force of gravity down the inclined plane. The results of these are tabulated in the same manner as the preceding, and the most singular discrepancies present themselves. For instance, it would appear that in one particular case a duty of double the amount of that effected by the condensing engine was performed by an equal expenditure of power; that compared with a fixed non-condensing engine at equal pressure, the locomotive, though labouring against the heavy counter-pressure of the blast from which the other is free, is assumed to have performed equal work with less than one half the expenditure of power. That if the resistance assigned by Dr. Lardner as opposed to the progressive motion of the train be correct, the efficiency of the steam in the locomotive is more than double that obtained by the best condensing engines; more than treble that derived from stationary non-condensing engines, and equal to the performance of a Cornish expansive engine, doing a 60 million duty with a bushel of coals. With such results before us, the resistances assigned as opposed to and overcome by the locomotive at different velocities, must be regarded as utterly inconsistent with reality, and as resting on no solid foundation.

The preceding results show also that errors have crept in by the adoption of the theoretical method of reducing undulatory surfaces to a level. M. de Pambour extends the length of the road as a compensation for the acclivities or for the help afforded by the bank engines, and Dr. Lardner diminishes the time of the trip to that which he assumes would be

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occupied in performing it on a dead level. If the principles on which these corrections for the acclivities and declivities are made, be correct, other facts than we are at present acquainted with must be taken into account before it can be demonstrated that a given power will convey a given load at some certain increased velocity along a level compared with the actual velocity along any given undulating line. The resistances which enter into the composition of the sum of the forces are ever varying to such an extent, that it may be doubted whether the theoretical level be not a pure fiction with reference to the practical results of the experiment.

The effective power of a locomotive engine, or the excess of power after overcoming its proper friction and the resistance from the blast, is solely expended in the generation of momentum. This which is the product of the mass and the velocity represents the useful mechanical effort exerted by the steam, and may always be ascertained under all the practical circumstances of railway traffic. The consumption of power as water, in the shape of steam, is a third quantity which may be also readily ascertained. The application which may be made of the above data is comprehended in the following propositions. First, that equal momenta would result at all velocities from an equal amount of power expended in equal times by the same engine, if the forces opposed to progressive motion and to the effective use of steam in the engines were uniform at all velocities. Secondly, the difference between the momenta generated by a unit of power in a given time at various velocities, measures the difference in the sum of the resistances opposed to the power at those velocities. Having ascertained the gross weight of an engine tender and train—their mean velocity—and the expenditure of water as steam during the trip, simple computations will inform us of—

1. The mechanical effect realized by a given power at all velocities.
2. The total increase or decrease of resistance at all velocities.
3. The ratios which the increase or decrease of resistance at different velocities bear to the ratios of those velocities.

Two other results also follow from the above, and which may be termed the commercial results, viz., the amount of gross and useful tractive effect realized by an equal expenditure of power at all velocities. The difference between these is a useless quantity in a practical sense, being the costly waste of power incident to the locomotive functions of the engine and tender over and above the waste arising from the unascertained and ineffective portion of the whole power required for the blast. The reductions and computations necessary for the exhibition and development of these views are contained in two tables. They relate to forty-nine experiments, being those already referred to, and those by Mr. N. Wood, on the Great Western, and London and Birmingham Railway, and some others. One of these tables contains the velocity of the engines, the consumption of water as steam, the loads, the absolute momenta per second; the momenta generated by equal power in equal times, viz., by 1 lb. of water as steam per second; the weights of the gross and useful loads moved by equal powers, viz., by one cubic foot of water as steam, at the velocity of each experiment, with various other elements. The other table contains a summary of the ratios of the velocities and of their squares, brought into juxtaposition with the ratios of the power expended to produce equal momenta, equal gross and equal useful effects, by the comparison of pairs of experiments on the engines given in the preceding table. This table also shows the influence of velocity in the expenditure of power to produce equal mechanical and equal commercial effects; and the amount of loss attributal to the increase of resistance at the higher velocities. The author discusses in great detail the various circumstances of these experiments, and the inferences and practical conclusions which may be deduced therefrom: and comes to the conclusion, that the determination of the performance of locomotive engines by the methods here set forth, is as practicable, exact, and demonstrative of their relative powers and dynamic excellence, as the determination of duty done by pumping engines.

The intensity of the pressure on the opposite side of the piston arising from the blast has been but imperfectly stated. By some, the discharge of the steam has been likened to a jet, and considered continuous. But an attentive observer can appreciate by his ear that an interval exists between the alternate discharges of steam from the two cylinders. That these jets are periodic and not continuous, is also distinctly evidenced by the audible pulsations in the chimney, even at the very highest velocities of an engine, and their duration may be measured at lower speeds. Upon this intermittent action of the blast depend, in a great measure, the resultant pressure against the piston, and the production of a sufficient current of air through the fire, both which effects would be materially changed in intensity by the substitution of a continuous for a periodic current. The precise duration of the jet, or of the time of the steam evacuating the cylinder, can only be determined by direct and careful experiments; but its period may be ascertained within definite limits; for since a single discharge is completed within the time occupied by the piston in accomplishing a half stroke, and the pauses between two successive discharges are distinctly perceptible, a single blast cannot occupy the fourth part of the time of the revolution of the crank shaft, and very probably does not exceed the eighth part, or the period of a quarter stroke of the piston. Under no circumstances, then, can the pressure from the blast oppose the piston much longer than during one fourth of the stroke. With an active pressure, then, of 30 lbs. per square inch, the mean resistance from the blast would not be greater than $7\frac{1}{2}$ lbs., and with a pressure of 15 lbs. not greater than $3\frac{3}{4}$ lbs. per square inch, against the pistons. The author then proceeds to cite several observations and experiments made by himself, which are confirmatory of the preceding argument respecting the blast, and he was led conclusively to the fact, that $\frac{1}{4}$th of the power of the engine experimented upon, at working pressures of 20 lbs. and 15 lbs., was absorbed in blowing the fire; and the escape of the steam from the cylinder was four times swifter than the motion of the piston.

The author lastly treats of the expenditure of power for a given effect by fixed and locomotive non-condensing engines. But few experiments on the expenditure of steam for a given effect by non-condensing stationary engines have been made. The relative consumption of fixed condensing and non-condensing engines has been treated of by the late Mr. Charles Sylvester, of Derby, whose knowledge and accurate theoretical analysis of the subject are shown by the close accordance of his conclusions with the facts established on two engines of these classes at certain working pressures. His conclusion that the relative economy of these engines will be as the quantities of steam consumed, or as 1 to 1·72, at those pressures, is accurately confirmed by the results here recorded. Mr. Sylvester also showed, that by increasing the pressure upon the same non-condensing, and by enlarging the area of the condensing engine's cylinder and air pump, so as to maintain the steam in it at a uniform pressure per square inch for all loads, the economy of the former would gradually approach and finally equal that of the latter. The results obtained in the preceding part of the paper furnish numerous comparisons between the locomotive and fixed non-condensing engines, and the consumption of the latter has been used, together with the condensing engine, as the test of the accuracy of the data of resistance assigned to the former by the various analysts. The accurate determination of the expenditure of steam by the same locomotive engine, in which the values of the friction and of the blast pressure were ascertained, admits of the consumption of water as steam for given effects being determined, and thus narrows the grounds of doubt, and establishes more correct data for ascertaining the real resistance opposed to progressive motion on railways. The application of these principles, as borne out by the experiments of the author, and their particular bearing on the experiments which have been the subject of the previous ample and detailed discussion, form the conclusion of Mr. Parke's series of communications on steam boilers and steam engines.

ROYAL SOCIETY.

March 19.—The Marquess of Northampton, President, in the chair.—The following paper was read:—

"Contributions to Terrestrial Magnetism," by Major E. Sabine.—An increased activity has recently been given to researches in terrestrial magnetism, with the definite object of obtaining correct maps of the magnetic phenomena, corresponding to the present epoch, over the whole surface of the globe. To aid these researches, and to facilitate the comparison of the general theory of M. Guass with the facts of observation, maps have been constructed of the magnetical lines, both as computed by the theory, and as derived from observations already obtained. The theoretical and actual lines of the declination and intensity have thus been represented in maps recently published in Germany and England, as have also the lines of the inclination computed by theory; but the corresponding map or the latter element derived from observations is yet wanting. The object of the present communication is to supply this desideratum, as far as regards the portion of the globe contained between the parallels 55° N. and 55° S., and the meridians of 20° E. and 80°W.; comprising the Atlantic Ocean and the adjacent coasts of the continents on either side. The observations chiefly employed for this purpose are two series *made at sea;* one by Mr. Dunlop, of the Paramata observatory, in a voyage from England to New South Wales, in 1831; the other by Lieutenant Sulivan, of the Royal Navy, in a voyage from England to the Falkland Islands and back, in 1838 and 1839. The observation of the magnetic dip at sea, which was commonly practised by the distinguished navigators of the last century, was unfortunately not resumed when the interest in such researches was revived on the restoration of peace: but it is by such observations only that the lines of inclination can be independently traced over those large portions of the globe which are covered by the ocean. The difficulties which attend the observation, occasioned by the motion and the iron of a ship, require the adoption of several precautions, which it is particularly desirable at this time to make generally known. The series of Messrs. Dunlop and

Sulivan are discussed in this view; and the value of results obtained under circumstances of due precaution is pointed out by their success. The position of the lines on the land portion of the map is derived from 120 determinations in various parts of Europe, Africa, and America, between the years 1834 and 1839, of which about the half are now first communicated. The series of Messrs. Dunlop and Sulivan contain also observations of the magnetic intensity made at sea; Mr. Dunlop's by the method of horizontal vibrations, and Lieutenant Sulivan's by the instrument and method devised by Mr. Fox. The degree of precision which may be obtained by experiments thus conducted is shown by the comparison of these observations with each other, and with the isodynamic lines previously derived from observations made on land. The first section of this paper concludes with discussions on the relative positions of the lines of least intensity and of no dip, and of the secular change which the latter line has undergone in the ten years preceding 1837. In the second section the observations of Mr. Dunlop are combined with recent observations on the coasts of Australia, by Captains Fitz Roy, Bethune, and Wickham, of the Royal Navy, to furnish a first approximation to the position and direction of the isodynamic lines over that portion of the Indian Ocean which is comprised between the meridian of the Cape of Good Hope and New South Wales.

RECORD OF PUBLIC WORKS.

The Southampton Docks.—Engineer's Report.—Gentlemen,—I beg to report to you that the dock works have been carried on by the contractors through the last autumn, and up to this time, with great energy.

"It having been deemed advisable to complete and open one portion of these docks at as early a period as possible for the reception of the largest class of steam-vessels, and sailing-vessels up to 600 or 700 tons burthen, my attention has been particularly directed to this object, and to make the Tidal dock in the first instance; I am accordingly constructing the pile-foundations necessary for the quay-walls on both sides of the entrance, and on the southern (or sea-ward) side of this dock. This piling is in great forwardness.

"I am also forming the embankments for enclosing the ground of the close dock from the tideway, the western side of which is completed. Its southern and eastern embankments are also in full progress, and likely to be finished in the course of the ensuing spring: and the construction of the remainder of the Tidal dock and the close dock will be carried on in due progress.

"The number of men hitherto employed on the works has averaged about 250; there are now about 300 on the ground.

"The extent of work performed to this time consists of about 1,000 feet in length of pile-driving for the foundations of the quay-walls, upon which upwards of 20 engines are at this moment in full operation; and of excavations amounting to nearly 70,000 cubic yards. The soil produced by the latter is advantageously applied to the formation of the embankments for the close dock; it is very adhesive and impervious, qualities particularly favourable for sea embankments, and for making and maintaining the docks; and this the late severe storms have sufficiently tested, no damage having been done thereby to the embankments, nor to the piling.

"The Osborne Quarry, the property of the Company, has also been opened by the contractors, and preparations are made for conveying its stone to the docks. The contractors have also made arrangements for obtaining other stone from Gurnet Bay, Portland, and Swanage, and have deposited a large quantity of blue lias lime-stone and of timber in store upon the Company's ground.

"Means are likewise in preparation for conveying thither the soil purchased from Mr. Buchan at Wolston Cliff.

"Considerable preparation of machinery for carrying on these works has likewise been made by the contractors. Independently of the pile-engines, already at work, a powerful dredging engine, lighters, wagons, &c., are also making, and near completion. I have, therefore, reason to expect that the entrance and southern side of the Tidal dock will be ready for the reception of trade by the end of the present year.

"I remain, Gentlemen, your very obedient, faithful servant,

"Francis Giles."

"*February* 20, 1840."

Sheffield and Manchester Railway.—We understand that this important line of railway is at length about to be proceeded with in earnest. It is expected that the whole of the distance between Manchester and Glossop will be under contract during the present summer, and we think that if the directors are supported in their efforts by the shareholders, and supplied with funds to enable them to press forward the works with energy and spirit, they may succeed in completing and opening to the public that portion of the line in the course of the summer of 1841, and thus secure at once a large and profitable traffic between Manchester and the populous manufacturing districts of Ashton, Staly-bridge, Mottram, Glossop, &c., besides that which they will derive by shortening the difficult road journey between Manchester and Sheffield.—*Liverpool Standard.*

Croydon Railway.—Mr. Cubitt's Report on the cost of this line contains the following tabulated statement of the cost of the several bridges, which will be interesting to our readers.

Bridges:—	£.	s.	d.
Viaduct at Corbett's lane	9374	13	8
Boundary walls at ditto	559	6	3
Timber viaduct	2505	15	0
Black ditch bridge	5062	6	10
Surrey canal bridge	7361	11	1
Cold-blow farm ditto	618	12	2
Foot-bridge, Five-bell lane	456	14	6
New cross bridge	3161	7	0
Finches'-bridge	2603	9	5
Deptford-common bridge, No. 1	628	8	6
Ditto ditto, No. 2	1102	3	0
Calgates's bridge	1353	12	10
Owen's bridge	1032	12	11
Colson's bridge	873	18	8
Sydenham bridge	2981	7	6
Anerley bridge	1761	13	6
Jolly Sailor bridge	2612	5	1
Croydon-common bridge, No. 1	1069	3	10
Ditto ditto, No. 2	1136	0	11
Cross-road bridge	1394	2	0
Total of bridges	£47649	4	8

It is stated that Professor Steinheil, of Munich, has succeeded in constructing clocks to be moved and regulated by galvanic power.

The Ribble Navigation.—The respective works for the improvement of the navigation of the Ribble have been progressing in the most favourable manner. Messrs. Marsden and Bond, the contractors for taking out the rock, have proceeded very satisfactorily with the execution of their contract. The excavation in the first stretch of the Coffer dam is now within the work of a day or two of being completed. The Directors, with the approval of the Engineer, thought it most desirable (taking into account the unavoidable expense incurred in the erection of the dam) to have the rock taken out to a lower level than was originally contemplated; and they are now glad to report that an extra depth of 4 feet 6 inches (notwithstanding the unfavourable season) has been obtained under this stretch, which level they propose carrying through the remainder of the rock to be excavated: this will give a depth of water of from 19 to 23 feet, at ordinary spring tides, with a width of channel of 100 feet. The Directors confidently expect that the remaining two lengths of the rock excavation, will be completed in the course of the present year. The dredging operations, under the advice of the Engineers, have been confined during the past half year to that part of the river between the 'Willows and the Chain.' The Directors have reported that the dredge is working very efficiently; 30,510 tons of gravel and sand have been raised from the bed of the river, giving an extra depth of water in that part of the river in which she has been working, of about 5 feet. From soundings, which the Directors have recently had made in the dredged channel, they report that this extra depth is still maintained, and that there appeared to be no tendency to silt up in any part of the new excavation. From the Report of the Harbour Master, the Directors state, that the channel is now 2 feet deeper, from the Chain to the Savick Brook; and the increase of depth in this part of the navigation, may, in the opinion of the Engineers, be attributedto the dredging of the upper part of the channel. The Directors, at the request of the Merchants, have been induced, within the last half year, to purchase a small steamer, for the combined purpose of a tug and passage boat, and which is now regularly plying, during the spring tides, between Preston and Lytham. The tonnage for the past half year has produced the sum of 380*l*. 16*s*. 9*d*., being an increase of about 145*l*. upon the half year ending December, 1838. The Directors have fixed the tonnage rates for vessels navigating the river for the present year, at 4*d*. per ton, for crossing each line, being an advance of 1*d*. per ton upon the rates charged last year, and one-third below the sum which the company are authorized to levy by the act.

Great Western Railway.—The ten-feet wheels attached to the locomotive engines employed on this railway not being found fully to answer the expectations of the directors, they have altered their plan, and in future wheels of seven feet diameter are to be employed. The result has been the attainment of the speed of fifty-six miles an hour. On Saturday, the 28th ult., the "Firefly," a new engine manufactured on

this principle by Messrs. Jones and Co., of the Viaduct Foundry at Newton, made an experimental trip from Paddington to Reading, and the following is a statement of her performance. She left the station at Paddington at 13 minutes 18 seconds past 11 a.m., and reached Reading at 59 minutes 43 seconds past 11, having passed the first milepost at 11 hours 15 minutes 57 seconds, and the 35th at 11 hours 58 minutes and 44 seconds, which is equivalent to one mile in one minute and 17⅘ seconds, or more than 46 miles an hour. During the journey one of the tender springs broke and caused some additional friction on the axles. The load was two carriages and one truck. At 3 hours 19 minutes and 2 seconds the party started on their return to London with two carriages. They stopped to take in water at Twyford, which detained them 14 minutes and 44 seconds, and finally arrived at Paddington at 21 minutes 3 seconds past 4. The 29th milepost from London was passed at 3 hours 44 minutes 50 seconds, and the second at 4 hours 16 minutes 21 seconds, which is equal to the speed of one mile in 1 minute 11⅗ seconds, or an average of 50½ miles per hour. The greatest speed attained was from the 26th to the 24th milepost, which was done at the rate of 56 miles an hour. This is the greatest speed at present attained in the history of locomotive power; what will ultimately be the greatest it is impossible to foretell.

Preston and Wyre Railway.—The works of this railway, opening into Preston, are in a state of very active progress. Within the last few weeks, an immense quantity of brickwork has been erected on this portion of the line. We understand that an idea is entertained of the railway being ready for opening in the course of the ensuing summer. So far as we can judge, however, there is no prospect of this being realized—*Preston Chronicle*.

Chester and Crewe Railway.—We understand that on Friday last an accident occurred on the new tunnel under the canal, at Christleton, in consequence of a leakage in the puddle, which interrupted the traffic on the line of canal for a few hours. We are happy to be enabled to state that the damage is inconsiderable, and no delay in the progress of the works will arise from the occurrence.—*Chester Courant*.

St. Petersburg, March 26.—There are a great number of workmen employed on the railway between Vienna and Warsaw, and we understand that no time will be lost in finishing this important undertaking.

Black Marble.—The largest block of black marble ever produced from the quarries in Galway, Ireland, has just been landed at Messrs. Serle and Foote's stone wharf, Abindon-street, Westminster. We understand it is to form part of a most magnificent marble staircase, now executing for Hamilton palace, in Scotland.

Thames' Embankment.—A meeting of gentlemen desirous that the opportunity afforded by the proposed measure for the embankment of the Thames, now before Parliament, should not be lost for securing to the public a right of way along its banks, was held at the Guildhall Coffee-house on Tuesday last, Sir W. Heygate, Bart., in the chair. There were present, amongst others, Major-General Sir F. Trench, M.P., and Mr. Martin, as well as several members of the corporation of London, and other gentlemen. A general feeling of surprise and regret appeared to pervade the meeting that no provision was contemplated or intended for an object so important to the communication between the east and west ends of the town, and to the health of the inhabitants of the metropolis, London being the only great city in which the inhabitants are excluded from the banks of the river. It also seemed apparent to the meeting that the circumstance of the exclusion of Sir F. Trench's name from the House of Commons committee indicated an intention not to make such an improvement part of the plan. The gentlemen present unanimously came to the following resolution:—"That a committee having been appointed by the Right Hon. the House of Commons to consider the subject of embanking the river Thames, and it appearing highly desirable that the present opportunity should not be lost of converting a portion of such embankment into a public walk or road, for the purpose of a communication from Southwark-bridge to Hungerford-market, as well as for the health and recreation of the inhabitants of the metropolis, a petition to the House of Commons, praying 'that no measure for embanking the Thames which does not embrace such a provision should pass into a law,' be prepared and submitted to another meeting, to be shortly held, for the purpose of taking such petition into consideration."—*Times, April* 7.

Portsmouth Floating Bridge.—The floating bridge is about to commence working. The bridge and its appurtenances are alike perfect and ready for action; but before the directors commence operations in earnest, they are wisely anxious to complete the landing-place on the Portsmouth side. With a view to enable horses and carriages to ascend the inclined plane with greater facility, the directors are laying down two granite track-ways at that place. Everything promises a speedy and auspicious opening to this great public thoroughfare and convenience.—*Hampshire Independent*.

The great attraction at present for the lovers of the picturesque is the bridge over the valley of the South Esk, which is to connect the Dalkeith coalfield with the railway. It consists of five arches of 120 feet span each, which are constructed of built beams of timber, abutted upon stone piers of the most graceful architecture. It is believed to be the second of the kind that has ever been built; and of all the fine works undertaken by the Duke of Buccleugh, no one bears stronger proof of his taste and magnificence. The bridge is within ten minutes' walk of the railway station in Dalkeith.

Railway Terminus at Greenwich.—The trains run under a shed of sixty feet span, having twelve feet of pavement on each side, forming a promenade 300 feet in length, eleven large windows looking into the London-road, and the same number giving a view towards the Thames. On the roof, at the end of the shed, is a large leaden tank, containing 25,000 gallons of water to supply the engines; and above the shed a weather-cock, representing a locomotive engine; the beams and iron stays which sustain the roof of the shed are of prodigious strength, and weigh each four tons; of these beams and stays there are twenty-two in number, weighing together eighty-eight tons, lined inside and out, and covered with slate and zinc. A handsomely finished stone staircase, ten feet wide, leads to the waiting rooms, and down about twenty stone steps into a colonnade, through which the passengers pass into the London-road, Greenwich.

Lancaster and Preston Railway.—The recent fine weather has been as favourable as could be desired for the progress of the works. The principal building at the Lancaster terminus has been run up with great rapidity, and will be "reared," that is, roofed, next week. The style is, Grecian Ionic, and the structure will have a tasteful appearance, and be altogether an ornament to the town.—*Lancaster Guardian*.

North Midland Railway.—This great line will be open from Derby to Sheffield, forty miles, in the first week in May The celebrated station at Derby for the three companies, the North Midland, Midland Counties, Birmingham and Derby Junction—which, it is said, will be one of the finest railway stations in the kingdom—is in a state of great forwardness. —*Derbyshire Chronicle*.

MISCELLANEOUS.

British Association.—The arrangements for the meeting at Glasgow, of the "British Association for the Advancement of Science," in September, are already in a very forward state. The number of admissions for Glasgow, and circuit of fifteen miles round it, has, from the increasing reputation of the association, been necessarily restricted to 1,400, leaving room for 1,800 strangers (including ladies), this being about an average attendance; and the estimated expense of each meeting, including the cost of museum and models, is about £3,000. The ensuing meeting at Glasgow is expected to be very numerously attended. Committee appointed for Edinburgh—Sir J. Robison, Sir J. G. Dalyell, , Graham, Dr. Alison, Dr. Christison, J. Forbes, Esq., Dr. D. Reid, H. Reid, Esq., and J. Tod, Esq. The Marquess of Breedalbane, President of the Association, has given the munificent donation of £400, towards defraying the expenses of the meeting at Glasgow, in September.

Institution of Civil Engineers.—At the weekly Meeting of this influential body, on Tuesday the 25th of February, three models were brought forward, which are worthy of a few words of notice.—The first of these was that of a canal boat, of small breadth of beam, and draught of water, about 80 feet long, and fitted for traction at the rate of 10 or 12 miles in the hour; the same as the port boats on the Ardrossan Canal, in Scotland. The peculiarity of this model consists in the adaptation of an 80 feet boat to 60 feet locks, which is accomplished by having 10 feet at each end of the boat articulated by hinges, so that they may be turned into a vertical position when about to enter the lock. It seems that the weight of the men who conduct the boat is sufficient to make those moveable ends act as part of one entire structure, when the boat is in progress through the water; and the additional pressure on the permanently horizontal 60 feet by the turning of them up, is an advantage rather than otherwise, when the boat is in the locks. This plan has been tried upon the Irish canals, and has succeeded.

The second model is, in our opinion, a very choice and valuable one. It is a sliding jack, by means of which the conductor and stoker of a railway engine can replace it on the rails without further assistance, in the event of its slipping off. It was very justly observed by Mr. Walker, the highly talented President of the Institution, "no railway train ought to be without this machine, which is of small weight and ready use, and can be carried in the tender with no trouble, and very little want of power."

The third model was that of a new mode of attaching the axis of the paddle wheels of a steam-boat to the horizontal shaft of the engine, and detaching the same when necessary. We had not time fully to

examine it, but from what we saw, we are inclined to think that it bears more analogy to the fable of the progeny mountain in labour.

Galvanic Engraving.—The plate from which the duplicate is to be taken is first placed in a vessel properly adapted for the purpose, and is then covered with a solution of sulphate of copper, through which the galvanic stream is transmitted. This causes a decomposition, or, in other words, the constituents of the salt are removed from each other, the metallic copper resulting from the action being deposited in a series of thin *laminæ* upon the original plate. This decomposed copper forms a second plate, which, on removal from the other, exhibits every line and mark traced by the graver or etching-tool upon it, with this difference, that what is bas-relief in one is alto-relief in the other, and the engraved lines of the original are raised lines in the duplicate. The sheet of copper thus produced becomes a normal plate, or mould, from which, by a similar process, an *ad infinitum* number of plates may be taken, in every respect equal to the original, and capable, like it, of giving perfect printed impressions. The value of this practical discovery is great, inasmuch as it will supersede the necessity of expensive steel-plate engravings, by mutiplying copies of those on copper-plates, at the cost of a few shillings, and loss of a few days only. Impressions from medals, coins, and dies may be obtained in the same way.

Novel Spectacle.—The quarrying operations on Killiney-hill, Dublin have assumed a high degree of interest, in consequence of the steps taken for the removal of a portion of the cliff, which, being of a much harder quality than the rest of the rock, has hitherto been left untouched in the centre of the quarry. This mass, which projects considerably beyond the face of the cliffs at either side, is about seventy feet high, and nearly fifty feet thick, and the portion which it has been determined to detach weighs, at least, 50,000 tons. To effect the separation of this immense bulk of rock, two holes, or drifts, as they are technically termed, of dimensions altogether unprecedented in any quarrying or mining operations attempted in Ireland, have been bored in it. One of these, fifteen feet in depth, and with a diameter of four inches, is driven backward from the principal face of the cliff: the other, of much greater dimensions, being twenty feet in depth, by five and a half inches in diameter, is driven laterally, and approaches the head of the former within a few feet. The charges for these immense bores amounted to nearly two hundred pounds of gunpowder. The experiment succeeded fully to the expectation of the mining engineers who planned it. A vast quantity of material fell with an awful crash, and volumes of dust enveloped the whole quarry for several minutes. Thousands of the citizens visited the scene by means of the Kingstown railway, and many adventurous youths chose stations of great peril, the better to see the explosion. No accident whatever occurred.

Safety Valves.—M. Sorel has announced to the Academy of Sciences the invention of a safety valve, which, at the moment the pressure has passed a certain limit, announces the fact by a whistle, and stops the combustion of the fire by shutting a register or damper. A second, but different, sound, tells when the boiler is growing short of water.

Gas.—We understand that Mr. H. Mitchell, the spirited landlord of the Queen's Head Inn, has had an apparatus affixed to his kitchen fire-place, by Mr. John Pitt, Gas Engineer of Plymouth, which supplies his house with twelve lights of the most pure coal gas. Mr. Pitt lately erected a similar apparatus at the Ship and Castle Inn, Falmouth. The expense of fitting up these miniature gas works is only about £20 or £25; and the cost of the gas itself is no more than 10s. a year for each light.—*Cornwall Gazette.*

College for Civil Engineers.—The council for this institution have elected the following professors in their institution:—Mechanics, Mr. R. Wallace, M. A.; mathematics, Mr. O. Burne and Mr. A. W. Horneman, B. A., Cantab.; civil architecture and general construction, Mr. J. Elms, architect, C.E.; naval architecture, Mr. J. Waterman, of the Admiralty; physics, Mr. H. Lewis, M. A., Cantab.; chymistry, Mr. T. Everett, Professor of Chymistry, Middlesex Hospital; mineralogy and geology, Mr. T. Webster, F. G. S.; statistics, Mr. C. Taylor, LL.D., Trinity College, Dublin; French language and literature, Mr. Lucien de Rudelle, M. A., University, Paris; German, Dr. Stromeyer, University, Wurtzburg; Greek and Latin, the Rev. J. R. Page, M. A., Cantab., resident chaplain to the college. Secretary, Mr. J. E. B. Curtis.

New Steam Vessel.—Experiments are in the course of being tried with the model of an entirely new form of steam-vessel, and, as far as they have yet gone, with every prospect of a successful result. At present we can only state of this remarkable invention, that there are no paddle-wheels, nor external works of any kind. The whole machinery is in the hold of the vessel, where a horizontal wheel is moved by the power of steam, and, acting upon a current of water, admitted by the bow and thrown off at the stern, propels the mass at a rapid rate. By a very simple contrivance of stop-cocks, &c., on the apparatus, the steamer can be turned on either course, retarded, stopped, or have her motion reversed. This will be literally a revolution in the art of steam navigation.—*Hampshire Advertiser.*

Captain Ross's Expedition.—Letters have been received from the Antarctic expedition, dated St. Helena, the beginning of February. Lieutenant Lefroy, of the Royal Artillery, who is to conduct the magnetic observatory on that island, had then landed with his instruments and assistants, and occupied Napoleon Bonaparte's house at Longwood, which has been assigned as his residence, and in the neighbourhood of which his observatory is to be built. From St. Helena Captain Ross proceeds to the Cape of Good Hope, to establish Lieutenant Eardley Wilmot, R. A., and his party in a similar observatory, where corresponding observations are to be made during the three years in which the expedition will remain in the southern hemisphere. We understand that, by adopting proper precautions, the officers succeeded in making magnetic observations at sea with as much precision as on land, the two ships sometimes telegraphing to each other at the same minute of dip. The importance of this success towards the prosecution of the objects of the voyage will be estimated when it is considered how large a portion of the southern hemisphere is covered by the sea. Captain Ross obtained soundings in the middle of the Atlantic Ocean, and far distant from any land, with a line of 2,500 fathoms, being, we believe, by far the greatest depth that has ever been reached by a sounding line.—*Literary Gazette.*

Tanning.—A discovery has been made which seems likely to revolutionize the trade. By means of a tanning machine or pair of horizontal rollers fixed over a tan-pit, between which is introduced a belt or band of hides attached by ligatures to each other, to the number of 50 to 100, and by which the rollers are constantly fed or supplied, the hides are lifted out of the pit on one side of the machine; and as they pass between the rollers the exhausted ooze or tanning liquor is pressed out of them, and they are deposited in folds in the pit, on the other side of the machine, where they absorb another supply of fresh ooze. The first hide having been inserted between the rollers, the others follow in succession, and upon arriving at the end of the band the motion of the roller is reversed, and the belt is returned through the machine to receive another squeeze. This alternating motion is constantly repeated, the pit being replenished from time to time with fresh solutions of tan, till the operation is completed. The effects produced by this simple plan, as we have satisfied ourselves by the inspection of documents from those who have been working on the patent method for many months, and from those who have purchased, manufactured, and worn the leather, are—1st. The shortening the time of tanning to one-fourth of that generally required. 2d. The production of a considerable increase of weight. 3d. The leather tanned by this method resists water longer than that tanned by the old process. 4th. The new method is cheaper to work than the old. 5th. That it is applicable to the existing tan-yards, at a comparatively trifling expense, with a capability of working in rounds or series, and of expending tan and liquor. 6th. That it is available for all sorts of leather.—*Bristol Paper.*

A New and Effectual Method to Kyanize Timber.—Within the last two or three weeks the Manchester and Birmingham Railway Company have commenced Kyanizing their wood sleepers in a much more quick and effectual manner than by the old mode of simply depositing the timber immersed in the prepared liquid. The company have had made a resisting a pressure of 250lbs. on the inch. This vessel being filled as large iron cylindrical vessel, weighing about ten tons, and which is about thirty feet long, and six or seven feet in diameter, made from wrought iron plates, five-eights thick, and double rivetted, which vessel is capable of compactly as possible with wood sleepers, twelve inches broad and seven inches thick, the liquid is then forced in with one of Bramah's hydraulic pumps, and worked by six men to a pressure of 170lbs. on the inch. By this means the timber is completely saturated throughout in about ten hours, which operation, on the old system, took some months to effect.

Turning Lathes.—At the ordinary meeting of the Society of Arts on Wednesday, the large silver medal was awarded to Mr. J. Hick, jun., of Bolton, for an improved expanding mandrel for turning lathes. It is necessary that a mandrel should fit so accurately, as to bite on the inner surface with a force sufficient to counteract that of the tool, and, in the ordinary mode, the same mandrel cannot be used for two pieces which are of different diameters. Consequently, in many engineering establishments, a stock of mandrels is kept, amounting to 600 or 700. Mr. Hick purposes to do the same work with eight sizes of the mandrel, from one inch and a quarter to ten inches. He effects his object by having the spindle of the mandrel shaped on the frustrum of a cone, on the face of which are four dove-tailed grooves to receive wedges, the under faces of which have the reverse inclination of the cone, so that the lines of their outside faces are always parallel with the axis of the mandrel. A nut is screwed on the spindle, which acts on the wedges through the medium of a conical cup, which drives them up to their bearings inside of the work.

PROPOSED COLLEGE AT BRISTOL.—We understand that it is intended to erect a college in this city, on the plan of King's College, London, in which the course of education will be strictly conducted on the principles of the Protestant church. We hear also that the Bristol Clergy Society have purchased a piece of ground, where they are about to erect an asylum for a limited number of the widows and daughters of deceased clergymen.—*Bristol Journal.*

THE Duke of Buccleuch, with his usual consideration, has given orders for the immediate erection of a new church at Howick, the church accommodation of that populous town being far from adequate to the wants of the inhabitants. His Grace not only intends being at the sole expense of the structure, but purposes also to endow it.

NEW PALACE.—There is exhibiting in the picture shops, the "design for a royal marine palace, proposed to be erected at Brighton." The print is dedicated I. L. Goldsmid, Esq., by the architect, Mr. David Mocatta. The site selected is that now occupied by the ruins of the Antheom at the top of Adelaide-crescent, facing the sea, and only a few hundred yards from the beach. The grand entrance would be from the south. The style of architecture seems a compound of the Greek, Italian, and Moorish. The whole would be enclosed by extensive gardens, excepting to the south; and we have reason to believe that a very liberal offer has been made to provide the money required to carry the design into effect, if approved by her Majesty.

OF public works in Italy, the roads between Kieste and the province of Mersina, Cataina, and Salerno, are undergoing great and important repairs. The king's palace at Naples is about to be restored, and the railroad between Naples and Castellamere is nearly completed, and several lofty mountains are to be connected by hand-bridges. The harbour of Leghorn is to be enlarged and improved.

THE quantity of pig iron made in Staffordshire last year is calculated at rather more than 338,000 tons, and the number of puddling furnaces 581, each consuming 12½ tons of coal per week. It is further calculated that, owing to the reduction of 20 per cent. in the make, the accumulation of pig iron during the puddlers' turn-out will be worked down in the ensuing quarter. Orders in the midland counties are steady, and an advance of 5*s.* per ton has taken place in Scotland.—*Leeds Intelligencer.*

GOLD AND SILVER GLASS.—Two curious and astonishing specimens of a new manufacture, brought forward by the French, have just been exhibited to various members of the Royal Society, at a *soirée* given by their president, the Marquess of Northampton. They were rich silk curtains, having all the appearance of being figured with silk and gold, in the most gorgeous patterns, though both brilliant materials, were nothing more than woven glass, and may be manufactured for a mere trifle.

THE CHANNEL ISLANDS.—The *Guernsey Star* says, "The rumour gains ground that the Southampton Railway Company intend placing three steamers on the station to run to the Islands and St. Malo. It is also reported that the contemplated transfer of the mail packets from Weymouth to Southampton forms a part of these arrangements, it being probable that the Company will contract with the Post-Office for the conveyance of letters to the islands.

BRITISH QUEEN.—We have been favoured with a sight of the accounts of one of the shareholders in this noble vessel, and find that 5 per cent. has been paid on every instalment, from the date of payment. If this has been taken out of her earnings in the three voyages from July to January, as we understood it has, it would amount to 9 per cent. on the half-year. We have been informed that a balance of £5,000, or above 5 per cent. on her cost (£90,000,) was also in hand on the 1st of January; and that she had never made a single trip without a profit. She is expected in England on Thursday next, from her fourth trip.

LIST OF PATENTS GRANTED DURING APRIL.

To Claude Joseph Edmée Chaudron Junot, of Brewer Street, Golden Square, operative chemist, for certain improved processes for purifying, and also for solidifying tallows, grease, oils, and oleaginous substances.—Sealed 30th March—six months for enrolment.

Henry Martin, of Morton Terrace, Camden-town, for improvements in preparing surfaces of paper.—Sealed 30th March—six months for enrolment.

William Neal Clay, of Flimby, Cumberland, gentleman, for improvements in the manufacture of iron.—Sealed 31st March—six months for enrolment.

John Leberecht Steinhaeuser, of Upper Islington-terrace, gentleman, for improvements in spinning and doubling wool, cotton, silk, and other fibrous materials,—being a communication.—Sealed 31st March—six months for enrolment.

Peter Bancroft, of Liverpool, merchant, and John Mc Innes, of the same place, manufacturing chemist, for an improved method of renovating or restoring animal charcoal, after it has been used in certain processes or manufactures to which charcoal is now generally applied, and thereby recovering the properties of such animal charcoal, and rendering it again fit for similar uses.—Sealed 31st March—six months for enrolment.

Charles Cummins, of Leadenhall-street, chronometer-maker, for certain improvements in barometers and sympiesometers.—Sealed 2nd April—six months for enrolment.

James Stead Crosland, of Leeds, engineer, for certain improvements applicable to locomotive and other steam engines.—Sealed 2nd April—six months for enrolment.

Thomas Smedley, of Holywell, North Wales, gentleman, for improvements in the manufacture of tubes, pipes, and cylinders.—Sealed 4th April—six months for enrolment.

Harrison Blair, of Kearsley, manufacturing chemist, and Henry Hough Watson, of Little Bolton, chemist, for an improvement or improvements in the manufacture of sulphuric acid, crystallized soda, and soda ash, and the recovery of a residuum or residuums, applicable to various useful purposes.—Sealed 6th April—six months for enrolment.

Richard Beard, of Egremont-place, New-road, gentleman, for improvements in printing calicoes and other fabrics,—being a communication.—Sealed 6th April—six months for enrolment.

Edward Thomas Bainbridge, of Park-place, St. James's, gentleman, for improvements in obtaining power.—Sealed 13th April—six months for enrolment.

Thomas Young, of Queen-street, merchant, for improvements in lamps.—Sealed 13th April—six months for enrolment

James Caldwell, of Mill-place, Commercial-road, engineer, for improvements in cranes, windlasses, and capstans.—Sealed 15th April—six months for enrolment.

John Gold, of Etna Glass Works, Birmingham, glass manufacturer, for improvements in the manufacture of decanters and other articles of glass.—Sealed 15th April—six months for enrolment.

William Potts, of Birmingham, brass-founder, for certain apparatus for suspending pictures and curtains.—Sealed 15th April—six months for enrolment.

Louis Auguste de St. Sylvain, Baron de Los Valles, of Nottingham-street, Marylebone, for certain improvements in cleansing, decorticating, purifying, and preserving corn and other grain, being a communication.—Sealed 15th April—six months for enrolment.

William Grimman, of Camden-street, Islington, modeller, for a new mode of wood paving.—Sealed 15th April—six months for enrolment.

Thomas Robinson Williams, of Cheapside, gentleman, for certain improvements in obtaining power from steam, and elastic vapours or fluids, and for the means employed in generating such vapours or fluids; and also for using these improvements in conjunction with distillation or evaporation, and other useful purposes.—Sealed 15th April—six months for enrolment.

Joseph Whitworth, of Manchester, engineer, for certain improvements in machinery or apparatus for cleaning and repairing roads or ways, and which machinery is also applicable to other purposes.—Sealed 15th April—six months for enrolment.

William Unsworth, of Derby, silk lace manufacturer, for an improved tag for laces.—Sealed 16th April—six months for enrolment.

Samuel Wilkes, of Darleston, iron-founder, for improvements in the manufacture of vices.—Sealed 16th April—six months for enrolment.

William Henry Bailey Webster, of Ipswich, surgeon, R.N., for improvements in preparing skins and other animal matters for the purpose of tanning; and the manufacture of gelatine.—Sealed 16th April—six months for enrolment.

Samuel Marlow Banks, of Bilston, Stafford, gentleman, for improvements in the manufacture of iron.—Sealed 16th April—six months for enrolment.

Robert Cooper, of Petworth, near Evesham, Gloucester, gentleman, for improvements in ploughs.—Sealed 16th April—six months for enrolment.

Francis Molineux, of Walbrook-buildings, gentleman, for improvements in the manufacture of candles, and in the means of consuming tallow and other substances for the purposes of light.—Sealed 23rd April—six months for enrolment.

Elijah Galloway, of Manchester-street, Gray's-inn-road, engineer, for improvements in steam engines; which are also applicable to engines for raising and forcing fluids.—Sealed 23rd April—six months for enrolment.

Jonathan Sparke, of Langley Mills, Northumberland, agent, for certain improved processes or operations for smelting lead ores.—Sealed 23rd April—six months for enrolment.

John White, of Manchester, engineer, for certain improvements in vices.—Sealed 23rd April—six months for enrolment.

James Malcolm Rymer, of Henrietta-street, civil engineer, for certain improvements in castors for furniture, such improved castors being applicable to other purposes.—Sealed 23rd April—six months for enrolment.

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